

PYRAMID POWER

Smithsonian

October 2015 | smithsonian.com

THE DISCOVERY OF THE WORLD'S
OLDEST PAPYRUS SHEDS
NEW LIGHT ON THE
GENIUS OF THE
PHARAOHS

THE MAKING OF EGYPT'S ANCIENT WONDERS

PLUS

HEMINGWAY EXCLUSIVE

The Novelist's Tortured Love Life

COSMIC EXPLOSION

Einstein 100 Years Later

THE HOWLING

Our Wild Kinship With Wolves

BECAUSE SOMEDAY

Every day will be
a personal day. |



Alert:
Fidelity Meeting



Attachment:
Retirement
Income Plan



Reminder:
Today

SAVE

**Every someday needs a planSM.
Put some certainty in your retirement
lifestyle with a guaranteed stream of income.**

One simple investment gives you cash flow for as long as you want—or as long as you live.
Call to talk with a Fidelity representative about your retirement plan.



Fidelity.com/income
866.465.0537

Investing in a variable annuity involves risk of loss—investment returns, contract value, and for variable income annuities, payment amount are not guaranteed and will fluctuate. A contract's financial guarantees are solely the responsibility of and are subject to the claims-paying ability of the issuing insurance company. Before investing, consider the investment objectives, risks, charges, and expenses of the annuity and its investment options. Call or write to Fidelity or visit Fidelity.com for a free prospectus or, if available, a summary prospectus containing this information. Read it carefully. Fixed income annuities available at Fidelity are issued by third-party insurance companies, which are not affiliated with any Fidelity Investments company. These products are distributed by Fidelity Insurance Agency, Inc.

Keep in mind that investing involves risk. The value of your investment will fluctuate over time and you may gain or lose money.
Fidelity Brokerage Services LLC, Member NYSE, SIPC. © 2015 FMR LLC. All rights reserved. 712138.2.0



68



Hemingway in Love

After a long silence, a close friend of Hemingway reveals what the famed writer confided about the affair that changed his life

BY A.E. HOTCHNER



Contributors 4

Discussion 6

Phenomena 11

American loon: Curve Ahead

Art: Stolen Kisses

Adaptation: Dental Giants

Computing: Enough Said

Small Talk: Gregory Maguire

Tribute: Alice, Adapted

Fast Forward: A Life Aquatic

Gravity's Muse 21

A hundred years after Albert Einstein first discovered general relativity and revolutionized our understanding of gravity, the theory is still bearing fruit

BY BRIAN GREENE

Ask Smithsonian 96

COVER: The Pyramids of Giza, July 28, 2015.

Photo by David Degner / Getty Reportage

THIS PAGE: Ernest Hemingway, on his 1923 passport, when he worked as a newspaper correspondent.

26

The Power and the Glory

The discovery of an ancient harbor and a trove of papyri near the Red Sea reveals the surprising reach of the pharaohs who built the pyramids

BY ALEXANDER STILLE

38

Seeing the Forest and the Trees

The legendary photographer Sebastião Salgado has shifted his focus to restoring a devastated forest in his native Brazil. The result is spectacular

BY MCKENZIE FUNK

56

Shades of Gray

A wolf sanctuary in Washington State presents an arresting lesson in survival and what it means to be wild

PHOTOGRAPHS BY ANNIE MARIE MUSSELMAN
TEXT BY JOHN VAILLANT

EDITOR IN CHIEF Michael Caruso

ART DIRECTOR Maria G. Keehan

DEPUTY EDITOR Terence Monmaney

DIRECTOR OF EDITORIAL OPERATIONS

Debra Rosenberg

SENIOR EDITORS Kathleen M. Burke, T. A. Frail,

Arik Gabbai, Elizabeth Quill

NATIONAL CORRESPONDENT Ron Rosenbaum

STAFF WRITER Matthew Shaer

STAFF REPORTER Katie Nodjimbadem

COLUMNISTS Amanda Foreman, Brian Greene,

Sue Halpern, Bill McKibben, Clive Thompson

CORRESPONDENT Jeff MacGregor

CONTRIBUTORS Jerry Adler, Richard Conniff,

Joshua Hammer, Tony Horwitz, Franz Lidz, Michelle Nijhuis,

Tony Perrottet, Elizabeth Royte, Ariel Sabar, Paul Theroux,

Abigail Tucker

CHIEF PHOTOGRAPHY EDITOR Molly Roberts

COPY CHIEF Karen Larkins

DIGITAL EDITOR, MUSEUMS Beth Py-Lieberman

ASSOCIATE ART DIRECTOR Erik K. Washam

PHOTOGRAPHY EDITOR Brendan McCabe

ASSOCIATE PHOTOGRAPHY EDITOR

Jeff Campagna

DESIGNER Heather Palmateer

DIGITAL EDITOR, SMITHSONIAN.COM Brian Wolly

COPY EDITOR Jeanne Maglaty

ASSOCIATE WEB EDITORS

Megan Gambino, Victoria Jaggard

ART SERVICES COORDINATOR Tiffany Y. Ates

EDITORIAL ASSISTANT

Michelle Strange

READER SERVICES Carolyn McGhee

SECRETARY

David J. Skorton

BOARD OF REGENTS

CHANCELLOR

The Chief Justice of the United States

CHAIR

Mr. John W. McCarter, Jr.

VICE CHAIR

Dr. Shirley Ann Jackson

MEMBERS

The Vice President of the United States

Hon. John Boozman

Hon. Patrick J. Leahy

Hon. David Perdue

Hon. Xavier Becerra

Hon. Tom Cole

Hon. Sam Johnson

Hon. Barbara M. Barrett

Mr. Steve Case

Mr. John Fahey

Mr. Robert P. Kogod

Dr. Risa J. Lavizzo-Mourey

Mr. Michael M. Lynton

Mr. David M. Rubenstein

SMITHSONIAN NATIONAL BOARD

Mr. Robert D. MacDonald, **CHAIR**

Ms. Brenda J. Gaines, **VICE CHAIR**

Mr. Allan R. Landon, **VICE CHAIR**

Mr. Philip K. Ryan, **VICE CHAIR**

NATIONAL BOARD: Mr. Rodney C. Adkins,

Mr. Gordon M. Ambach, Ms. Valerie Anders,

Mr. William H. Bohnett, Mrs. Peggy P. Burnet,

Mrs. Suzi Cordish, Mr. Roger W. Crandall,

Mrs. Wendy W. Dayton, Mr. Vincent J. Di Bona,

Mr. Trevor Fetter, Mrs. Julie A. Flynn,

Mr. William J. Galloway, Mrs. Shelby M. Gans,

Mr. Ronald Gidwitz, Mr. Rick Goings,

Ms. Bonnie W. Gwin, Ms. Myra M. Hart,

Mr. Edward R. Hintz, Mrs. Nancy Hogan,

Mrs. Emily Zug-Huebner,* Ms. Judy S. Huret,

Ms. Jennifer Walston Johnson,

Mr. Dennis J. Keller, Mr. Jonathan M. Kemper,

Mr. Paul G. Koontz, Mrs. Betsy Lawer,

Ms. Cheryl Winter Lewy, Mr. David M. Love,

Mr. Kevin M. McGovern, Ms. Sarah E. Nash,

Dr. Jorge G. Puente, Mr. G. Jeffrey Records, Jr.,

Mrs. Kristin M. Richardson, Mr. John Outler Ryan,

Ms. Deborah Sara Santana, Mrs. Marna Schnabel,

Dr. Elisa Stephens, Ms. Fredericka Stevenson,

Mr. Michael E. Tennenbaum, Mr. John K. Tsui,

Mr. L. John Wilkerson, Ph.D.,

Ms. Deborah L. Winco-Smith

HONORARY MEMBERS: Mr. Robert McC. Adams,

Mr. William S. Anderson, Hon. Max N. Berry,

Mr. L. Hardwick Caldwell III, Mr. Frank A. Daniels,

Jr., Mrs. Patricia Frost, Mr. James M. Kemper, Jr.,

Mrs. Jean B. Mahoney, Mr. Paul Neely, Justice

Sandra Day O'Connor, Mr. William M. Ragland, Jr.,

Mr. Francis C. Rooney, Jr., Mr. Wilbur L. Ross, Jr.,

Mr. Lloyd G. Schermer, Hon. Frank A. Weil,

Mrs. Gay F. Wray (* Ex-Officio)

SMITHSONIAN ENTERPRISES

PRESIDENT Christopher A. Liedel

CHIEF CONTENT OFFICER Barbara Rehm

SENIOR VICE PRESIDENT, MEDIA GROUP Alan Chu

CHIEF REVENUE OFFICER Stephen P. Giannetti

CHIEF FINANCIAL OFFICER Bruce Dauer

SENIOR VICE PRESIDENT, RETAIL GROUP Ed Howell

SENIOR VICE PRESIDENT, CONSUMER

& EDUCATION PRODUCTS Carol LeBlanc

SENIOR VICE PRESIDENT Mark Bauman

CHIEF DIGITAL OFFICER Bill Allman

VICE PRESIDENT, GLOBAL BUSINESS

DEVELOPMENT Nicholas Namba

CHIEF TECHNOLOGY OFFICER Grace Clark

DIRECTOR OF AUDIENCE DEVELOPMENT

Jacqueline Moen

ADVERTISING

PUBLISHER, MEDIA/BUSINESS DEVELOPMENT

Lori Erdos

ACCOUNT MANAGERS

NEW YORK: Jaime Duffy, Meryle Lowenthal, Walker Mason

NORTHEAST: Alex Shumway

MIDWEST: Lorna Phillips

DETROIT: Lisa Steele

SOUTHWEST: Nuala Berrells

WEST: Steve Thompson, William G. Smith, Molly Balantine,

Mediacentric, Inc.

CANADA: Allan J. Bedard

UNITED KINGDOM: Will Nicholson, The Vision Network

JAPAN: Yoshinori Ikeda, Mayumi Kai

KOREA: B.J. Kim

DIRECT RESPONSE: MI Media Services, LLC, Marie Isabelle

ADVERTISING REVENUE ANALYST: Jim Ly

MARKETING/RESEARCH

ASSOCIATE PUBLISHER, MARKETING Judy Glassman

MARKETING DIRECTOR Elynn L. Hurwitz

ART DIRECTOR Annie K. Sullivan

ASSOCIATE MARKETING MANAGER Kate Kerley

ASSOCIATE RESEARCH MANAGER Linda Lawrence

INTERACTIVE AD OPERATIONS COORDINATOR

Michael Magette

PROMOTION COORDINATOR Christina Marocco

CONSUMER MARKETING

CONSUMER MARKETING DIRECTOR Lisa Dunham

PLANNING DIRECTOR Timothy M. Smith

RENEWALS AND GIFT DIRECTOR Susan Warner

NEW BUSINESS DIRECTOR Lori Paldino

RENEWALS & INTERNET MANAGER Michael Ivler

GIFT MANAGER Jonathan Balangon

MARKETING COORDINATOR, NEW BUSINESS

Rose Drayton

MANUFACTURING

DIRECTOR Sarah Kingsley

PREPRESS DIRECTOR Katherine Balch

PREPRESS MANAGER Frank Matthew Hale II

PREPRESS SYSTEMS MANAGER Penie Atherton-Hunt

COLOR AND QUALITY MANAGER Bill Whitcher

ONLINE PUBLISHING GROUP

DIRECTOR, DIGITAL TECHNOLOGY Todd Stowell

DIRECTOR, PRODUCT DEVELOPMENT Perrin Doniger

MARKETING MANAGER Lynette Mong

SENIOR DIGITAL DESIGNER Shaylyn Esposito

DIGITAL PRODUCERS Melissa Wiley, Caroline Williams

WEB DEVELOPER Sean Henderson

BUSINESS OFFICE

DIRECTOR, CORPORATE BUDGET & ANALYSIS

Ed Dequina

BUSINESS DEVELOPMENT MANAGER Shola Akinrolabu

ADMINISTRATIVE SUPPORT MANAGER James A. Babcock

ACCOUNTANT Joanne Hubbard

HUMAN RESOURCES

DIRECTOR Dana S. Moreland

BUSINESS PARTNER Jennifer N. Alexander

HR COORDINATOR Sibyl A. Williams-Green

RECRUITER Jay Sharp

EDITORIAL OFFICES:

MRC 5i3, Washington, D.C. 200i3-70i2, (202) 633-6090

SUBSCRIPTIONS: (800) 766-2149

P.O. Box 62i70, Tampa, FL 33662-2i70 Smithsonian.com

Outside the United States: (8i3) 9i0-3609

MAIN ADVERTISING OFFICE: 420 Lexington Avenue,

Suite 2335, New York, NY 10i70, (2i2) 9i6-1300



~~“Cancer,~~ you don’t have a chance.”

Holden Rushing | Fundraiser

Our mission is to end cancer in every corner of the world. Period.
To join in the fight, call 1-855-894-0145 or visit MakingCancerHistory.com.



Ranked number one in the
nation for cancer care by
U.S. News & World Report.

THE UNIVERSITY OF TEXAS
MD Anderson
~~Cancer~~ Center
Making Cancer History®

Contributors



Sebastião Salgado

He's one of the world's most celebrated photographers, creator of *Migrations*, *Workers* and other seminal collections. For the epic 2013 project *Genesis*, which he worked on for eight years with his wife and creative partner, Lélia Wanick Salgado, he documented people living in accord with their land and traditions. In his native Brazil, he's not only restoring thousands of acres of forest on property that once belonged to his family but also, he says, "working with the Indians to document their lives and assist them in asserting their ancestral land rights" (p. 38).

A.E. Hotchner

The 95-year-old author of *Papa Hemingway*, the best-selling biography, again writes about his old friend in *Hemingway in Love: His Own Story*. The memoir (exclusive excerpt: p. 68) covers a key phase in Hemingway's life that "he had never discussed but that he wanted me to know about in case he never got around to telling about it." Hotchner was co-founder, with Paul Newman, of Newman's Own, the food company that donates its profits to charity.

ILLUSTRATIONS BY Kareena Zerefos

McKenzie Funk

Because the Seattle-based writer has long reported on the abuses of the natural world and is accustomed to gloom-and-doom views of the future, he was struck by Sebastião Salgado's optimism (p. 38). "He was always looking for the beauty in the chaos," Funk says. "What was also striking was how hard he works. You can understand how he became the photographer he is: relentless." Funk, a National Magazine Award finalist, has also written for *Harper's* and the *New York Times Magazine* and is a founding member of Deca, a global journalism cooperative. His first book, published in 2014, was the critically acclaimed *Windfall: The Booming Business of Global Warming*.



Alexander Stille

In his book *The Future of the Past*, Stille examined how technology can help preserve—or threatens to destroy—pieces of our history. Which is why he was intrigued by the discovery of the oldest known papyrus (p. 26). "Material coming to light just a few years ago is reshaping our perceptions of life 4,600 years ago," says Stille, who is the author of four other books and a professor of journalism at Columbia University.

John Vaillant

The supreme challenge of our time is how we interact with the environment, says the award-winning author of books about survival in the wild, *The Golden Spruce* and *The Tiger*, and a new novel, *The Jaguar's Children*. "I don't know how you can write about the human experience without writing about nature." In his essay (p. 56), he draws a surprising link between people and our ancient yet misunderstood companion, the wolf.

5W Infographics

Led by the Velasco brothers—Samuel, Juan, Pedro and Martin—the groundbreaking information-design firm works with clients from the *New York Times* and Unicef to *Le Monde*. The biggest challenge to conveying new ideas about the pyramids, says Samuel, was mapping the waterways at Giza (p.32). 5W creations are featured in prestigious design collections such as *The Best American Infographics 2014* and *Understanding the World*.



Annie Marie Musselman

The photographer, whose passion is the plight of wildlife, hopes her images of rescued wolves at a Washington State sanctuary show the animals in a different light (p. 56).

"They're not just these storybook Little Red Riding Hood characters," she says. "When I sit with the wolves I feel at peace, like everything is perfect in the world." Musselman's Wolf Haven photograph series will be released as a book in 2016.

WORKS BY LEGENDARY HOLLYWOOD PHOTOGRAPHER
RICHARD SCUDDER



Richard Scudder



Discussion

Probably the best takedown of the Kudzu mythos I've read this year.

@jodyavirgan ON TWITTER

FROM THE EDITORS Readers were eager to add their own nominations to our 21st-Century Life List of the world's newest wonders. "I want to go to Middle Earth (New Zealand)," Jerry Wagner wrote on Facebook. George Clark of Eureka, California, suggested that seeking paradise closer to home would preserve the environment: "Finding pleasure in the simple things is . . . a prerequisite for humanity's future." Others reveled in the bucket list that CBS News praised as "out of the ordinary" and the Los Angeles Times said "crackles with energy." But some questioned how accessible the destinations were. "Ninety-nine percent of us can't afford even one location," Linda Gonzales said. Readers were also inspired by the tale of Margee Ensign, the American educator creating a refuge for young Nigerian women who have escaped from the terrorist group Boko Haram. "Ensign is my hero," wrote Sarah Cox Huffaker.

Lessons of Katrina

Having served on the Urban Land Institute team that made recommendations aimed at rebuilding New Orleans after Hurricane Katrina, I fully understand the disillusionment that Douglas Brinkley expresses ["Broken Promise"]. The breaking of the levees caused a natural disaster that was made worse by human error. One of my concerns is that racial bias would play a part in the city's recovery process. The broken promise impacted the entire city of New Orleans, but most especially African-American residents.

Yet it is still not too late to complete the difficult recovery process using the principles of inclusion and equity.

Philip S. Hart
LOS ANGELES, CALIFORNIA

Green Carpet

As a Southerner, I enjoyed Bill Finch's coverage of kudzu ["Legend of the Green Monster"]. I recall marveling at the vines devouring slopes north of my small hometown in Arkansas, and I had always partaken in the "unstoppable" myth of kudzu's growth. May I suggest, as further reading, the short horror story by Karl Edward Wagner titled, "Where the Summer Ends." The possibilities of what's hidden under that green carpet are sure to send a shiver down one's spine.

Lee Burks
FACEBOOK

Invasive plants, fish and insects brought here to do something great—stop erosion, provide food or eat another insect—always seem to turn the tables in a few years, and *they* become the problem.

Jackie Fillmore
FACEBOOK

Rare Bears

Something needs to save the rainforest ["The Spirit Bear"]. Glad it is that magnificent bear.

Kathleen M. Lynch
FACEBOOK

Discoveries at Jamestown

It always amazes me, reading of early settlers' strength and courage ["Four

Funerals and a Wedding"]. Yet they experienced the same infighting and plotting we see today.

Sherry Smith Myers
FACEBOOK

Here they're thinking they've got their "eternal" resting place, only to have some archaeologists digging them up a few centuries later. Is nothing sacred?

David Jewett
FACEBOOK

Caving In

As a former caver with the Cave Research Foundation, I thoroughly enjoyed your brief, but misleadingly titled article, "The Longest Cave," about Hang Son Doong, Vietnam. Although the cave's vestibule does appear enormous by volume, it does not come close to Kentucky's Mammoth Cave cave system, which now exceeds 400 continuous miles of mapped passage.

Ken Carstens
PROFESSOR EMERITUS
MURRAY STATE UNIVERSITY

Correction

Indeed, Vietnam's Hang Son Doong is not the world's longest cave, though it is frequently described as the largest.

CONTACT US

Send letters to LettersEd@si.edu or to Letters, Smithsonian, MRC 513, P.O. Box 37012, Washington, D.C. 20013. Include a telephone number and address. Letters may be edited for clarity or space. Because of the high volume of mail we receive, we cannot respond to all letters. Send queries about the Smithsonian Institution to info@si.edu or to OVS, Public Inquiry Mail Service, P.O. Box 37012, Washington, D.C. 20013.

FOLLOW US

@Smithsonianmag
[Facebook.com/smithsonianmagazine](https://www.facebook.com/smithsonianmagazine)

THE FUTURE WON'T WAIT LET'S RETHINK HIGH SCHOOL.

Join the movement to reimagine High School
and change the future of American education.

XQsuperschool.org
[#RethinkHighSchool](https://twitter.com/RethinkHighSchool)



Explore America Perfectly

★ 35 Itineraries Across America ★





Announcing the *America*. American Cruise Lines launched another brand new riverboat this year. Elegantly blending technology and tradition, American Cruise Lines is the leading river cruise line in the United States. We offer the largest fleet of small cruise ships, now with 8 ships traveling to over 70 different ports nationwide.



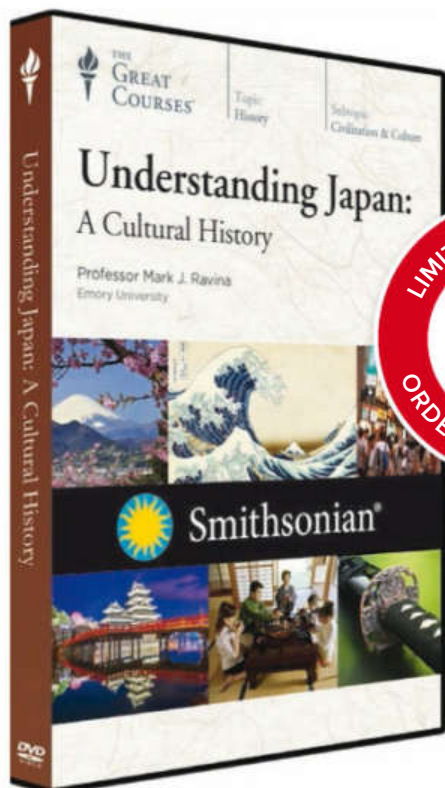
Call a Cruise Specialist today

1-800-460-6187

www.americancruiselines.com



Smithsonian



Experience the History and Culture of Japan

Japan's extraordinary culture is like no other in the world. The 2,000-year-old civilization grew through periods of seclusion and assimilation to cultivate a society responsible for immeasurable influences on the rest of the world.

In an exciting partnership with the Smithsonian, we present **Understanding Japan: A Cultural History**, delivered by renowned Japan scholar and award-winning professor Mark J. Ravina of Emory University. Every lecture draws extensively on the expertise of the Smithsonian's historians, as well as their vast collection of art, photography, and artifacts, making this cultural journey come to life in lavish visual detail. Professor Ravina combines his powerful narrative with the country's art, architecture, landscaping, literature, and food, giving you the chance to examine Japan's cultural history up close and at your own pace.

Offer expires 10/29/15

THEGREATCOURSES.COM/7ST

1-800-832-2412

Understanding Japan: A Cultural History

Taught by Professor Mark J. Ravina
EMORY UNIVERSITY

LECTURE TITLES

1. Japan: A Globally Engaged Island Nation
2. Understanding Japan through Ancient Myths
3. The Emergence of the *Ritsuryō* State
4. Aspects of the Japanese Language
5. Early Japanese Buddhism
6. Heian Court Culture
7. The Rise of the Samurai
8. Pure Land Buddhism and Zen Buddhism
9. Samurai Culture in the Ashikaga Period
10. Japan at Home and Abroad, 1300–1600
11. Japan's Isolation in the Tokugawa Period
12. Japanese Theater: Noh and Kabuki
13. The Importance of Japanese Gardens
14. The Meaning of *Bushidō* in a Time of Peace
15. Japanese Poetry: The Road to Haiku
16. Hokusai and the Art of Wood-Block Prints
17. The Meiji Restoration
18. Three Visions of Prewar Japan
19. War without a Master Plan: Japan, 1931–1945
20. Japanese Family Life
21. Japanese Foodways
22. Japan's Economic Miracle
23. Kurosawa and Ozu: Two Giants of Film
24. The Making of Contemporary Japan

Understanding Japan: A Cultural History
Course no. 8332 | 24 lectures (30 minutes/lecture)

SAVE UP TO \$190

DVD ~~\$269.95~~ **NOW \$79.95**
CD ~~\$109.95~~ **NOW \$59.95**

+\$10 Shipping, Processing, and Lifetime Satisfaction Guarantee
Priority Code: 108364

For 25 years, The Great Courses has brought the world's foremost educators to millions who want to go deeper into the subjects that matter most. No exams. No homework. Just a world of knowledge available anytime, anywhere. Download or stream to your laptop or PC, or use our free mobile apps for iPad, iPhone, or Android. Over 500 courses available at www.TheGreatCourses.com.



Phenomena

A CURATED LOOK AT SCIENCE, HISTORY & CULTURE

It's the nation's tallest monument, soaring 630 feet above the Mississippi River, 886 tons of stainless steel welded into a seamless curve, assembled with such precision that if either leg had veered off by just one-sixty-fourth of an inch the two couldn't have been joined in the middle. Completed 50 years ago this month, the Gateway Arch, the Midwest's best-known monument, was hailed as linking "the rich heritage of yesterday with the richer future of tomorrow."

Eero Saarinen, a young, Finnish-born aesthete, won a 1947 competition for the design, but not before Eero's father, Eliel (who designed Art Nouveau landmarks in Helsinki, including the famed central railway station), received a mistaken telegram including his name among the finalists. Eliel uncorked the champagne—only to take out another bottle after receiving word from an apologetic official that, in fact, his son had

The twisted
history of the
Gateway
Arch

AMERICAN ICON

Curve Ahead

by Fred Kaplan

In high winds,
the arch can
sway 18 inches



beat him out. Eero went on to design Washington Dulles International Airport, the TWA terminal at JFK International Airport in New York and a celebrated line of high modern furniture, but died of a brain tumor at 51, fourteen years after he dreamed up the arch and four years before it was finished.

Today there's little doubt about the gleaming monument's visual appeal—there are three million visitors annually—but the promised “richer future” hasn't exactly come to pass, and social critics put some of the blame for that failure on the arch itself.

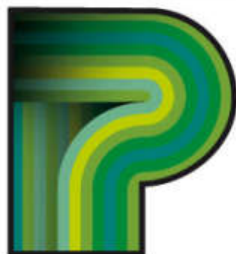
In 1934, local business leaders promoted the idea of a memorial to Thomas Jefferson and the expansionary vision of his Louisiana Purchase. But their real aim, according to Tracy Campbell, author of *The Gateway Arch: A Biography*, was to rid the city's waterfront of “blighted” property and bring in federal construction dollars. The city engineer, W.C. Bernard, presented the plan as “an enforced slum-clearance program.”

Following a rigged bond measure to cover the city's costs—the *St. Louis Post-Dispatch* counted 46,000 phony ballots, more than enough to tilt the outcome, and denounced the project as “election thievery”—40 square blocks of riverside property were bulldozed, including

290 businesses, mainly small factories in historic cast-iron buildings employing some 5,000 workers. FDR's interior secretary, Harold Ickes, nearly blocked the venture as “speculative real-estate,” until the war disrupted civilian public works projects. But after the war, President Harry Truman, a Missourian, let the money flow. Still, the site lay in empty squalor for a decade—and then came President Dwight Eisenhower's Interstate System of highways, a stretch of which passed along the site, reviving the arch's appeal as an outsized attraction for the vast stream of Americans vacationing in their cars.

But the highway also cut off many residents—mainly poor and black—from the development around the arch, aggravating racial tensions still fresh from when construction unions barred African-Americans from working on the site. The displacement came to epitomize 20th-century “urban renewal”—a euphemism, James Baldwin quipped, for “Negro removal.”

In 1940, St. Louis was America's eighth-largest city, an aspiring New York of the Midwest. Today its population ranking has fallen to 60th, and it has become the nation's fifth poorest city. “As a tourist attraction,” Campbell wrote, the arch “has proven a remarkable success,” but, like so many American cities optimized for a future dominated by cars and the highways needed to bring them in from the suburbs, “St. Louis might have had a better chance of renewal if it had never torn down those historic cast-iron buildings.”





Stolen Kisses

A new show looks back at a photo giant who blurred the lines

ART

Sexy lips are an advertising cliché—one that **Irving Penn** cheerfully upended in this 1986 photo, *Mouth (for L'Oréal)*. Smeared with more than a half-dozen shades of lipstick, in the manner of a painter's palette, the model's pout seems to mock the facade of perfect beauty. Like any good ad, the image seizes the viewer's attention, but it's more than just eye candy, says Merry Foresta, curator of a Penn retrospective—the first in 20 years—opening this month at the Smithsonian American Art Museum: “Though made to sell a product, it crosses the divide between commerce and art with astounding ease.” The artist, who died in 2009 at age 92, produced still lifes of cigarette butts and skulls as well as portraits of couture-clad models, but his defining talent for elevating fashion photography into the lordly realm of fine art is what keeps his work perpetually in style. —**AMY CRAWFORD**

Dental Giants

Sizing up the fangs of saber-toothed cats

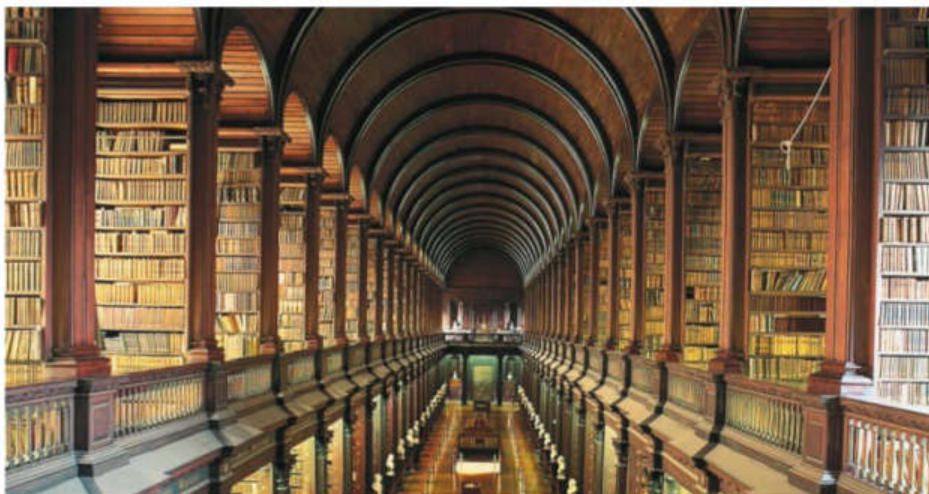
ADAPTATION

THE FABLED FANGS OF saber-toothed tigers, curved like bananas and just as long, erupted rapidly from the gums of the young cats at the rate of six millimeters per month. That's almost twice as fast as human fingernails sprout. "A little nub isn't useful. You can't sever another animal's artery," says Robert Feranec, a paleontologist whose team for the first time mapped the teething timeline of *Smilodon fatalis*, the fearsome feline that roamed the Americas as recently as 11,000 years ago. Despite a quick growth rate, Feranec says, the long teeth still took quite a while to grow. Fangs perfectly suited for stabbing the necks of beefy, lumbering animals like mastodon weren't fully developed until the cats were more than 3 years old. (Modern lions have mature chompers by around age 2.) *Smilodon* died out along with its supersized prey at the end of the last ice age. Suddenly, seven-inch-long teeth were overkill. —ABIGAIL TUCKER

Smilodon could open its jaws up to 120 degrees.

Enough Said

A new library contains every phrase that could ever be uttered



Scaled back so no two books share a page, the library still has 10 to the power of 4,677 books.

In his 1939 essay, "The Total Library," the Argentine writer Jorge Luis Borges imagined a library that held not just every book ever written, but every book that could be written, every book-length combination of characters in every possible sequence. It would contain, along with an almost infinite quantity of gibberish, all of civilization's wisdom, true accounts of the past and future, "... my dreams and half-dreams at dawn on August 14, 1934." It would be the reification of the "infinite monkey" thought experiment, which posits that enough typing monkeys would eventually reproduce *Hamlet*. So perhaps it's surprising that no one has tried to build one. Until now.

The Library of Babel, which takes its name from Borges' famous short story on the same theme, resides on a desktop computer in the

home of Jonathan Basile, in Washington, D.C. While re-reading Borges, Basile, 30, who studied English literature at Columbia University, realized that computer technology was bringing the Total Library within reach. So, despite having little programming experience, he spent six months trying to create it.

He quickly discovered that the library would require more digital storage than could fit in the entire universe. Basile calculated the number of "books" (of 410 pages, with 3,200 characters per page) as somewhere shy of 10 to the power of two million. Instead, he settled on a library that exists as an algorithm, a program that runs whenever someone plugs in text at libraryofbabel.info. The program displays all of the pages on which that text would appear if the library were real. The page itself is

COMPUTING

not stored but exists as a set of coordinates that will display the same text each time.

It just may be the most fascinatingly useless invention in history. As Borges foresaw, wisdom is useless if it is lost in a sea of nonsense. Yet people still look for it. One obsessed seeker looked for religious significance in the appearances of the different names of God. "I don't think it has any practical applications like that for finding hidden text or coded messages," Basile says. In his view, the novelty of the library is that it treats Hamlet's soliloquies with the same statistical indifference as anything produced by that infinite simian typing pool. At least one writer recounted laboring over a sentence and then, finally satisfied, entering it into the search engine to discover, says Basile, "it was there all along." —JERRY ADLER

OUR FUNDS HAVE A RECORD LIKE A BROKEN RECORD.

TIAA-CREF: Lipper's Best Overall Large Fund Company¹ three years in a row. For the first time ever. How? Our disciplined investment strategy aims to produce competitive risk-adjusted returns that create long-term value for you. Just what you'd expect from a company that's created to serve and built to perform.



Learn more about our unprecedented, award-winning performance at TIAA.org/Perform

BUILT TO PERFORM.

CREATED TO SERVE.



BEST OVERALL LARGE FUND COMPANY¹

The Lipper Awards are based on a review of 36 companies' 2012 and 48 companies' 2013 and 2014 risk-adjusted performance.

¹The Lipper Award is given to the group with the lowest average decile ranking of three years' Consistent Return for eligible funds over the three-year period ended 11/30/12, 11/30/13, and 11/30/14 respectively. TIAA-CREF was ranked among 36 fund companies in 2012 and 48 fund companies in 2013 and 2014 with at least five equity, five bond, or three mixed-asset portfolios. Past performance does not guarantee future results. For current performance and rankings, please visit the Research and Performance section on tiaa-cref.org. TIAA-CREF Individual & Institutional Services, LLC, Teachers Personal Investors Services, Inc., and Nuveen Securities, LLC, members FINRA and SIPC, distribute securities products. ©2015 Teachers Insurance and Annuity Association of America—College Retirement Equities Fund (TIAA-CREF), 730 Third Avenue, New York, NY 10017. C24849B

Consider investment objectives, risks, charges and expenses carefully before investing. Go to tiaa-cref.org for product and fund prospectuses that contain this and other information. Read carefully before investing. TIAA-CREF funds are subject to market and other risk factors.



SMALL TALK

Gregory Maguire

The author of *Wicked* has a new novel, *After Alice*, inspired by Lewis Carroll's classic tale

Why are so many children's stories full of terror?

All stories give shape to human conundrums. Children's stories usually predict survival, when we know that in real life, as John Irving wrote in *The World According to Garp*, we are all terminal cases. The terrible aspects of fairy tales lend contrast to the exercise of winning through. Without shadow, there is no possibility of apprehending light.

Is there a common ingredient that makes for memorable fantasy worlds?

Tolkien talked about something he called "arresting strangeness." Interestingly, this can apply to a single figure of speech. ("The sun was a blob of albino ink.") If every word and action derives equally from an illogical point of origin, the fantasy world convinces. Incidentally, this holds true even for our conception of our own cosmos, starting from an imagined big bang. (Who lit the fuse, etc?) Our lives are a fantasy, but everything we work out within the bounds of this improbable construct tends toward the rational.

Is there a recent book, film or TV show that you think will stay vital for centuries?

The cultural references of the *Toy Story* trilogy of films may age, but the depiction of childhood will last at least as long as *Alice's Adventures in Wonderland* has already lasted—150 years and counting.

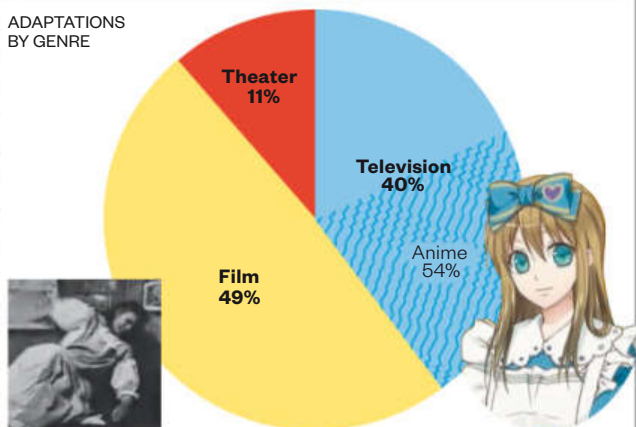
Alice, Adapted

She's 150 years old, and the world is still wondering about her

"What wert thou, dream-Alice, in thy foster-father's eyes?"

asked Lewis Carroll after first seeing an 1886 musical pantomime breathe weird life into his fairy tale heroine. Here, a menagerie of the countless "Alice in Wonderlands" since then.

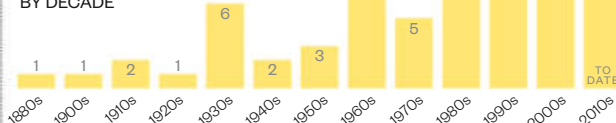
ADAPTATIONS BY GENRE



Alice first appeared on screen in a short film in 1903, 48 years before Disney's doe-eyed rendering.

Alice-themed TV spiked with multiple Japanese anime series, often starring a girl named "Arisu."

ADAPTATIONS BY DECADE



In **Tim Burton's** live-action, CGI-heavy adaptation, Alice returns to "Underland" to dethrone the Red Queen. The 2010 film paired the source material's macabre bent with American cinema's king of zany grotesquerie. Add another to the heap: 2016 will see a Burton-produced sequel.



America's first stage "Alice," directed by **Eva Le Gallienne** in 1932 (she's the White Queen at left), had revivals through the 20th century—including a production 50 years later in which Le Gallienne, age 83, reprised her role.

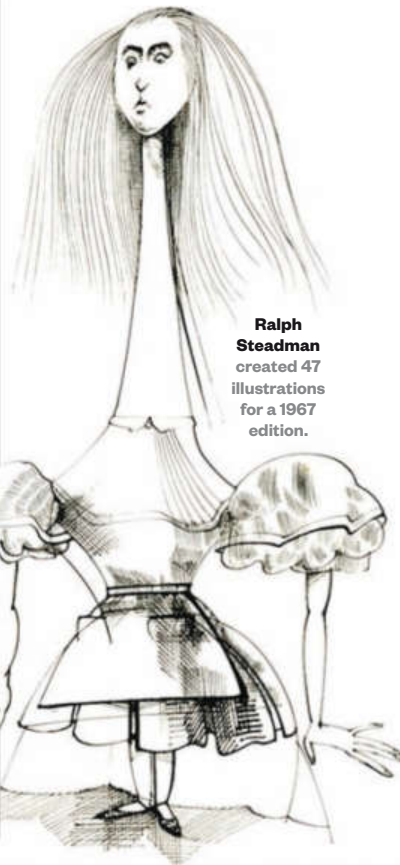
Alice's Adventures in Wonderland had its first printing in 1865, bound in red cloth and illustrated by **John Tenniel**, the famed political cartoonist for *Punch* magazine. A "perfect piece of artistic printing," Carroll raved.



TRIBUTE



November will see a premiere in London's West End of a stage musical called *Wonder.land*—"Alice" reimagined for our time, with music by **Damon Albarn**, of Blur and Gorillaz fame. Aly is a bullied multiracial schoolgirl who's able, while playing an online game, to transform herself into a blond princess. This commentary on 21st-century Internet culture also suggests a more timeless childhood quest: the search for one's place in the world.



Ralph Steadman created 47 illustrations for a 1967 edition.

FINDING, FIXING & FIRING
HISTORY'S COOLEST WEAPONS



THE WEAPON HUNTER

series premiere
OCTOBER 5
MONDAYS 8PM ^{ET} _{PT}

smithsonianchannel.com

Smithsonian
CHANNEL 

©2015 Smithsonian Channel LLC. Smithsonian Channel is a trademark of Smithsonian Institution. Smithsonian Channel LLC is an authorized user.



A Life Aquatic

Lin (below) built a test version of the new installation earlier this year in her studio in New York City.

A tidal new work by the always provocative Maya Lin

When Maya Lin was 8 years old, her father brought home a box of marbles, the kind used by artisanal glass blowers. “It was like opening a box of water,” she recalls. “They capture light in a way I had never seen.” Nearly half a century later, the American

artist, who became famous at 21 for her winning design for the Vietnam Veterans Memorial in Washington, D.C., is using the same glimmering spheres to portray the Chesapeake Bay, the largest estuary in the United States. Each of the 168,000 marbles

forms a part of the whole, just as more than 2,700 species of plants and animals make up the Chesapeake ecosystem, which Lin describes as a single living entity. Inspired by a satellite image, *Folding the Chesapeake* will flow across the floor and onto three

FAST FORWARD

walls of Smithsonian’s newly renovated Renwick Gallery as part of an exhibition titled “Wonder,” which opens November 13. What does “wonder” mean to Lin? “It’s magical, it’s about beauty, it’s something that inspires awe.” —KATIE NODJIMBADEM



Making Waves

The artist has often plunged into our relationship with water



Mounds of earth up to 15 feet tall undulate across a former gravel pit at **Storm King Wavefield** in New Windsor, New York.



Pin River-Hudson is an ode to the New York waterway in thousands of straight pins. Other “pin rivers” include the Colorado and Yangtze.



A network of underground river channels in Indiana are brought to the surface in **Above and Below** at the Indianapolis Museum of Art.



Plan for your future. Consider Medicare supplement insurance.

Did you know that Medicare only covers about 80% of Part B medical costs? That means the rest is up to you. But a standardized Medicare supplement insurance plan could help you save in out-of-pocket medical costs.

Call UnitedHealthcare Insurance Company to learn more. As the insurer of the AARP® Medicare Supplement Plans, UnitedHealthcare Insurance Company offers a range of these plans to fit your needs and budget. And, these plans are the only Medicare supplement plans endorsed by AARP.*

With over 30 years of experience, UnitedHealthcare Insurance Company has the expertise and commitment to help you make informed decisions. Call now to speak to a licensed insurance agent/producer.

GO LONG®

Get more information. Call toll-free today.

1-866-270-0714

PROMO CODE: 3B3, TTY 711



*AARP endorses the AARP Medicare Supplement Insurance Plans, insured by UnitedHealthcare Insurance Company. UnitedHealthcare Insurance Company pays royalty fees to AARP for the use of its intellectual property. These fees are used for the general purposes of AARP. AARP and its affiliates are not insurers. Insured by UnitedHealthcare Insurance Company, Horsham, PA (UnitedHealthcare Insurance Company of New York, Islandia, NY for New York residents). Policy form No. GRP 79171 GPS-1 (G-36000-4). In some states plans may be available to persons under age 65 who are eligible for Medicare by reason of disability or End-Stage Renal Disease.

Not connected with or endorsed by the U.S. Government or the federal Medicare program.

This is a solicitation of insurance. A licensed insurance agent/producer may contact you.

CALL A LICENSED INSURANCE AGENT/PRODUCER AT THE TOLL-FREE NUMBER SHOWN IN THIS ADVERTISEMENT TO RECEIVE COMPLETE INFORMATION (INCLUDING OUTLINES OF COVERAGE) SHOWING BENEFITS, COSTS, ELIGIBILITY REQUIREMENTS, EXCLUSIONS AND LIMITATIONS.

You must be an AARP member to enroll in an AARP Medicare Supplement Plan.

AS2939ST

AARPMedicareSupplement.com

King Solomon's Secret Treasure: FOUND

Ancient beauty trapped in mines for centuries is finally released and available to the public!

King Solomon was one of the wealthiest rulers of the ancient world. His vast empire included hoards of gold, priceless gemstones and rare works of art. For centuries, fortune hunters and historians dedicated their lives to the search for his fabled mines and lost treasure. But as it turns out, those mines hid a prize more beautiful and exotic than any precious metal: chrysocolla.

Prized by the wisest king of the Bible. Known as the "Wisdom Stone," chrysocolla was considered a powerful talisman of healing and calming energy. Ancient rulers of the Biblical era relied on it for guidance and now this legendary treasure can be yours with our stunning *Earth & Sea Chrysocolla Necklace*. Call today to bring home 325 carats for **ONLY \$49!**

Nothing like it on Earth. The mesmerizing swirls of color in chrysocolla come from a unique combination of elements found in the rich mineral deposits of copper mines. When miners find a vein of blue-green, all digging stops so that the delicate chrysocolla can be extracted by hand.

Masterpieces of natural art. Our *Earth & Sea Chrysocolla Necklace* features a strand of polished, enhanced chrysocolla ovals—and silver-colored beads—that meet at a gorgeous teardrop pendant. Every chrysocolla is unique, showcasing a canvas painted by Mother Nature herself.

Your satisfaction is guaranteed. Wear the *Earth & Sea Chrysocolla Necklace* for a few weeks. If you aren't convinced that it's one of nature's most elegant creations, simply send it back within 60 days for a full refund of your purchase price. But once you experience this gorgeous gemstone for yourself, we're betting that you'll want to share King Solomon's secret with the world!

*Own the Most
Beautiful Stone
You've Never
Seen Before—
325 carats
for only \$49!*

TAKE 84% OFF INSTANTLY!

When you use your **INSIDER OFFER CODE**

Earth & Sea Chrysocolla Necklace ~~\$299*~~

Offer Code Price— \$49 + s&p

You must use the insider offer code to get our special price.

1-888-870-9513

Offer Code ESN276-01

Please use this code when you order to receive your discount.

- 325 ctw of chrysocolla
- 18" necklace (with 2" extender) secures with a lobster clasp

Smart Luxuries—Surprising Prices™



Necklace enlarged to show luxurious detail.

Stauer®

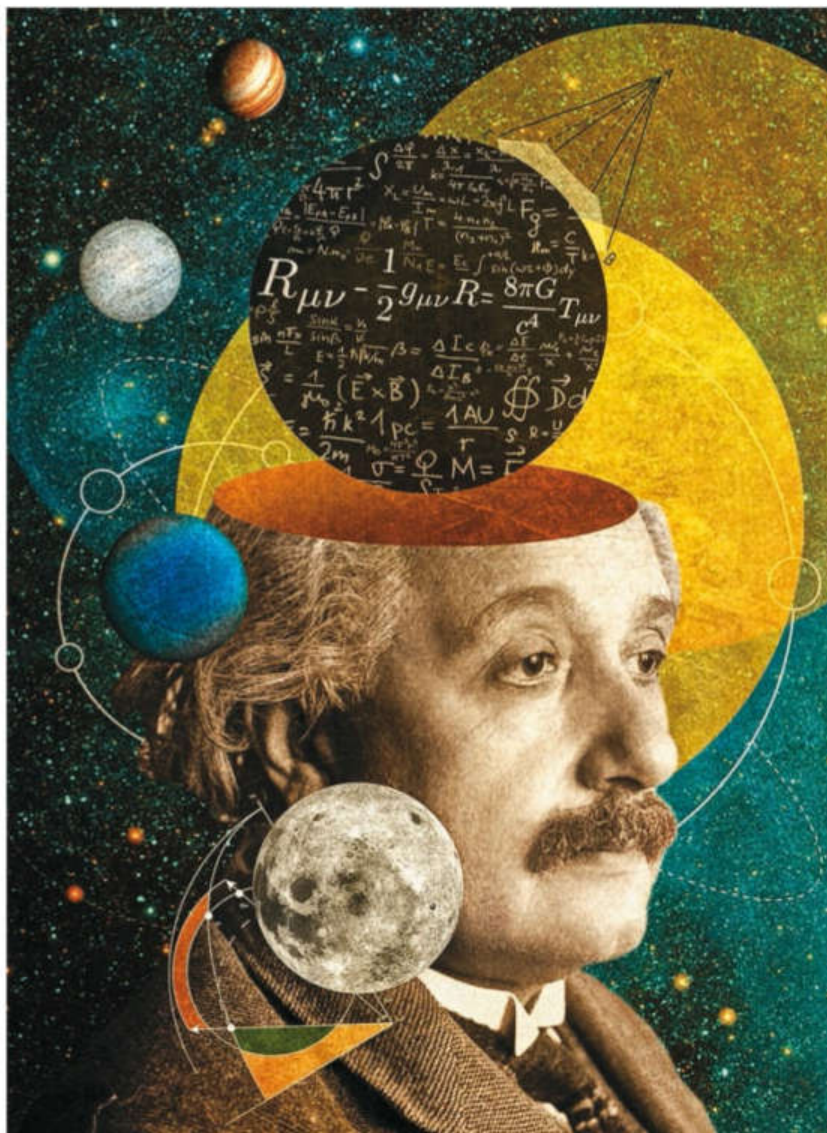
14101 Southcross Drive W.,
Dept. ESN276-01,
Burnsville, Minnesota 55337

www.stauer.com



Rating of A+

** Discount for customers who use the offer code versus the listed original Stauer.com price.*



Gravity's Muse

Einstein's relativity breakthrough a century ago was out of this world. Now it seems surprisingly down-to-earth

BY BRIAN GREENE *illustration by Peter Horvath*

I am exhausted. But the success is glorious.”

It was a hundred years ago this November, and Albert Einstein was enjoying a rare moment of contentment. Days earlier, on November 25, 1915, he had taken to the stage at the Prussian Academy of Sciences in Berlin and declared that he had at last completed his agonizing, decade-long expedition to a new and deeper understanding of gravity. The general theory of relativity, Einstein asserted, was now complete.

The month leading up to the historic announcement had been the most intellectually intense and anxiety-ridden span of his life. It culminated with Einstein's radically new vision of the interplay of space, time, matter, energy and gravity, a feat widely revered as one of humankind's greatest intellectual achievements.

At the time, general relativity's buzz was only heard by a coterie of thinkers on the outskirts of esoteric physics. But in the century since, Einstein's brainchild has become the nexus for a wide range of foundational issues, including the origin of the uni-



verse, the structure of black holes and the unification of nature's forces, and the theory has also been harnessed for more applied tasks such as searching for extrasolar planets, determining the mass of distant galaxies and even guiding the trajectories of wayward car drivers and ballistic missiles. General relativity, once an exotic description of gravity, is now a powerful research tool.

The quest to grasp gravity began long before Einstein. During the plague that ravaged Europe from 1665 to 1666, Isaac Newton retreated from his post at the University of Cambridge, took up refuge at his family's home in Lincolnshire, and in his idle hours realized that every object, whether on Earth or in the heavens, pulls on every other with a force that depends solely on how big the objects are—

diately shake too. That is, Newton's formula implies that gravity exerts its influence from one location to another instantaneously. That's not only faster than light, it's infinite.

Einstein would have none of it. A more refined description of gravity must surely exist, one in which gravitational influences do not outrun light. Einstein dedicated himself to finding it. And to do so, he realized, he would need to answer a seemingly basic question: How does gravity work? How does the Sun reach out across 93 million miles and exert a gravitational pull on the Earth? For the more familiar pulls of everyday experience—opening a door, uncorking a wine bottle—the mechanism is manifest: There is direct contact between your hand and the object experiencing the pull. But when the Sun pulls on the Earth, that pull is exerted across space—empty space. There is no direct contact. So what invisible hand is at work executing gravity's bidding?

Newton himself found this question

Einstein's answer, at once beautiful and mysterious, is that matter, such as the Sun and the Earth, causes space around it to curve, and the resulting warped shape of space influences the motion of other bodies that pass by.

Here's a way to think about it. Picture the straight trajectory followed by a marble you've rolled on a flat wooden floor. Now imagine rolling the marble on a wooden floor that has been warped and twisted by a flood. The marble won't follow the same straight trajectory because it will be nudged this way and that by the floor's curved contours. Much as with the floor, so with space. Einstein envisioned that the curved contours of space would nudge a batted baseball to follow its familiar parabolic path and coax the Earth to adhere to its usual elliptical orbit.

It was a breathtaking leap. Until then, space was an abstract concept, a kind of cosmic container, not a tangible entity that could effect change. In fact, the leap was greater still. Einstein realized that time could warp, too. Intuitively, we all envision that clocks, regardless of where they're located, tick at the same rate. But Einstein proposed that the nearer clocks are to a massive body, like the Earth, the slower they will tick, reflecting a startling influence of gravity on the very passage of time. And much as a spatial warp can nudge an object's trajectory, so too for a temporal one: Einstein's math suggested that objects are drawn toward locations where time elapses more slowly.

Still, Einstein's radical recasting of gravity in terms of the shape of space and time was not enough for him to claim victory. He needed to develop the ideas into a predictive mathematical framework that would precisely describe the choreography danced by space, time and matter. Even for



Even for Einstein, the challenge proved to be a monumental one. In 1912, he wrote to a colleague that “Never before in my life have I tormented myself anything like this.”

their mass—and how far apart they are in space—their distance. School kids the world over have learned the mathematical version of Newton's law, which has made such spectacularly accurate predictions for the motion of everything from hurled rocks to orbiting planets that it seemed Newton had written the final word on gravity. But he hadn't. And Einstein was the first to become certain of this.

In 1905 Einstein discovered the special theory of relativity, establishing the famous dictum that nothing—no object or signal—can travel faster than the speed of light. And therein lies the rub. According to Newton's law, if you shake the Sun like a cosmic maraca, gravity will cause the Earth to imme-

deeply puzzling, and volunteered that his own failure to identify how gravity exerts its influence meant that his theory, however successful its predictions, was surely incomplete. Yet for over 200 years, Newton's admission was nothing more than an overlooked footnote to a theory that otherwise agreed spot on with observations.

In 1907 Einstein began to work in earnest on answering this question; by 1912, it had become his full-time obsession. And within that handful of years, Einstein hit upon a key conceptual breakthrough, as simple to state as it is challenging to grasp: If there is nothing but empty space between the Sun and the Earth, then their mutual gravitational pull must be exerted by space itself. But how?

Explore the Culture of

Cuba



10-Night Cultural Voyages



Journey to Cuba in 2016 with Pearl Seas Cruises on an 11-day immersive people to people experience focused on the rich history, heritage, and contemporary life of the Cuban people. The brand new 210-passenger luxury *Pearl Mist* allows access to more of Cuba's ports and regions, while providing a relaxed means to interact with Cubans and explore the rich fabric of Cuban culture. These cultural voyages are subject to final approval by the U.S. and Cuban governments.

Pearl



Seas Cruises®

Call for a free brochure

1-888-669-5812

www.pearlseascruises.com



Canadian Maritimes • New England • Great Lakes
Panama Canal • Central America • Cuba

be a monumental challenge. In 1912, struggling to fashion the equations, he wrote to a colleague that “Never before in my life have I tormented myself anything like this.” Yet, just a year later, while working in Zurich with his more mathematically attuned colleague Marcel Grossmann, Einstein came tantalizingly close to the answer. Leveraging results from the mid-1800s that provided the geometrical language for describing curved shapes, Einstein created a wholly novel yet fully rigorous reformulation of gravity in terms of the geometry of space and time.

But then it all seemed to collapse. While investigating his new equations Einstein committed a fateful technical error, leading him to think that his proposal failed to correctly describe all sorts of commonplace motion. For

By November, this freedom bore fruit. Einstein corrected his earlier error and set out on the final climb toward the general theory of relativity. But as he worked intensely on the fine mathematical details, conditions turned unexpectedly treacherous. A few months earlier, Einstein had met with the renowned German mathematician David Hilbert, and had shared all his thinking about his new gravitational theory. Apparently, Einstein learned to his dismay, the meeting had so stoked Hilbert’s interest that he was now racing Einstein to the finish line.

A series of postcards and letters the two exchanged throughout November 1915 documents a cordial but intense rivalry as each closed in on general relativity’s equations. Hilbert considered it fair game to pursue an opening in a promising but as yet unfinished theory of gravity; Einstein considered it atrociously bad form for Hilbert to muscle in on his solo expedition so near the summit. Moreover, Einstein anxiously realized, Hilbert’s deeper mathemati-

his irritation: “The system you furnish agrees—as far as I can see—exactly with what I found in the last few weeks and have presented to the Academy.” To his friend Heinrich Zangger, Einstein confided, “In my personal experience I have not learnt any better the wretchedness of the human species as on occasion of this theory....”

A week later, on November 25, lecturing to a hushed audience at the Prussian Academy, Einstein unveiled the final equations constituting the general theory of relativity.

No one knows what happened during that final week. Did Einstein come up with the final equations on his own or did Hilbert’s paper provide unbidden assistance? Did Hilbert’s draft contain the correct form of the equations, or did Hilbert subsequently insert those equations, inspired by Einstein’s work, into the version of the paper that Hilbert published months later? The intrigue only deepens when we learn that a key section of the page proofs for Hilbert’s paper, which might have settled the questions, was literally snipped away.

In the end, Hilbert did the right thing. He acknowledged that whatever his role in catalyzing the final equations might have been, the general theory of relativity should rightly be credited to Einstein. And so it has. Hilbert has gotten his due too, as a technical but particularly useful way of expressing the equations of general relativity bears the names of both men.

Of course, the credit would only be worth having if the general theory of relativity were confirmed through observations. Remarkably, Einstein could see how that might be done.

General relativity predicted that beams of light emitted by distant stars would travel along curved trajectories as they passed through the warped region near the

CONTINUED ON PAGE 92

He corrected his error and set out on the final climb toward the general theory of relativity. But as he worked intensely on the details, conditions turned unexpectedly treacherous.

two long, frustrating years Einstein desperately tried to patch the problem, but nothing worked.

Einstein, tenacious as they come, remained undeterred, and in the fall of 1915 he finally saw the way forward. By then he was a professor in Berlin and had been inducted into the Prussian Academy of Sciences. Even so, he had time on his hands. His estranged wife, Mileva Maric, finally accepted that her life with Einstein was over, and had moved back to Zurich with their two sons. Though the increasingly strained family relations weighed heavily on Einstein, the arrangement also allowed him to freely follow his mathematical hunches, undisturbed day and night, in the quiet solitude of his barren Berlin apartment.

cal reserves presented a serious threat. His years of hard work notwithstanding, Einstein might get scooped.

The worry was well-founded. On Saturday, November 13, Einstein received an invitation from Hilbert to join him in Göttingen on the following Tuesday to learn in “very complete detail” the “solution to your great problem.” Einstein demurred. “I must refrain from traveling to Göttingen for the moment and rather must wait patiently until I can study your system from the printed article; for I am tired out and plagued by stomach pains besides.”

But that Thursday, when Einstein opened his mail, he was confronted by Hilbert’s manuscript. Einstein immediately wrote back, hardly cloaking

How to Tell Time Like a Man

Our digital-analog hybrid has two sides... tough and tougher.

Get it now for an unbelievable \$59!

Your watch shouldn't cost more than your car. It should look and feel like a power tool and not a piece of bling. Wearing it shouldn't make you think twice about swinging a hammer or changing a tire. A real man's timepiece needs to be ready for anything. But that's just my opinion. If you agree, maybe you're ready for the **Stauer Centurion Hybrid**. Use your Exclusive Insider Promotional Code below and I'll send it to you today for **ONLY \$59**.

This watch doesn't do dainty. And neither do I. Call me old-fashioned, but I want my boots to be leather, my tires to be deep-tread monsters, and my steak thick and rare. Inspiration for a man's watch should come from things like fast cars, firefighters and power tools. And if you want to talk beauty, then let's discuss a 428 cubic inch V8.

Did I mention the \$59 price tag? This is a LOT of machine for not a lot of money. The **Stauer Centurion Hybrid** sports a heavy-duty alloy body, chromed and detailed with a rotating bezel that allows you to track direction. The luminous hour and minute hands mean you can keep working into the night. And the dual digital displays give this watch a hybrid ability. The LCD windows displays the time, day and date, includes a stopwatch function, and features a bright green electro-luminescent backlight. We previously offered the **Centurion** for \$199, but with the exclusive promotional code it's yours for **ONLY \$59!**

No matter what, this watch can keep up. Thanks to the Stauer 30-day Money Back Guarantee, you've got time to prove it. If you're not totally satisfied, return it for a full refund of the purchase price. You also get a 2-year replacement guarantee on both movements. But I have a feeling the only problem you'll have is deciding whether to keep the **Stauer Centurion** on your dresser or tucked inside your toolbox.



"I work in the surveying and construction industry...

This is my work horse watch and I am proud to wear it."

— C.S. from Fort Worth, TX



**TAKE 70% OFF
INSTANTLY!**
When you use your
Promotional Code

Stauer Centurion Hybrid Watch— ~~\$199~~

Promotional Code Price Only \$59

or two payments of \$29⁵⁰ + S&P

Order now to take advantage of this fantastic low price.

1-800-333-2057

Your Insider Promotional Code: CNW413-03

Please use this code when you order to receive your discount.



Rating of A+

Stauer® 14101 Southcross Drive W., Dept. CNW413-03
Burnsville, Minnesota 55337 **www.stauer.com**

Digital-Analog Hybrid • Dual digital displays • Heavy-duty chromed body • 3 ATM Water Resistant
LCD windows for time, date and day • Luminous hands • Contrast Stitch Band fits a 7 1/4"-9 1/4" wrist

Smart Luxuries—Surprising Prices™



BY ALEXANDER STILLE

**PHOTOGRAPHS
BY DAVID
DEGNER**

THE POWER A



How far did the
Old Kingdom
pharaohs go
to build the
pyramids at
Giza? The
discovery of
the world's
oldest papyrus
and a long-lost
Red Sea port
offers startling
new clues

ND THE GLORY

F

ollowing notes written by an English traveler in the early 19th century

and two French pilots in the 1950s, Pierre Tallet made a stunning discovery: a set of 30 caves honeycombed into limestone hills but sealed up and hidden from view in a remote part of the Egyptian desert, a few miles inland from the Red Sea, far from any city, ancient or modern. During his first digging season, in 2011, he established that the caves had served as a kind of boat storage depot during the fourth dynasty of the Old Kingdom, about 4,600 years ago. Then, in 2013, during his third digging season, he came upon something quite unexpected: en-

tire rolls of papyrus, some a few feet long and still relatively intact, written in hieroglyphics as well as hieratic, the cursive script the ancient Egyptians used for everyday communication. Tallet realized that he was dealing with the oldest known papyri in the world.

Astonishingly, the papyri were written by men who participated in the building of the Great Pyramid, the tomb of the Pharaoh Khufu, the first and largest of the three colossal pyramids at Giza just outside modern Cairo. Among the papyri was the journal of a previously unknown official named Merer, who led a crew of some 200 men who traveled from one end of Egypt to the other picking up and delivering goods of one kind or another. Merer, who accounted for his time in half-day increments, mentions stopping at Tura, a town along the Nile famous for its limestone quarry, filling his boat with stone and taking it up the Nile River to Giza. In fact, Merer mentions reporting to “the noble Ankh-haf,” who was known to be the half-brother of the Pharaoh Khufu and now, for the first time, was definitively identified as overseeing some of



the construction of the Great Pyramid. And since the pharaohs used the Tura limestone for the pyramids’ outer casing, and Merer’s journal chronicles the last known year of Khufu’s reign, the entries provide a never-before-seen snapshot of the ancients putting finishing touches on the Great Pyramid.

Experts are thrilled by this trove of papyri. Mark Lehner, the head of Ancient Egypt Research Associates, who has worked on the pyramids and the

Sphinx for 40 years, has said it may be as close as he is likely to get to time-traveling back to the age of the pyramid builders. Zahi Hawass, the Egyptian archaeologist, and formerly the chief inspector of the pyramid site and minister of antiquities, says that it is “the greatest discovery in Egypt in the 21st century.”

Tallet himself is careful to speak in more measured terms. “The century is at the beginning,” he says at one of his digs along the Red Sea. “One must not enlarge this kind of find.” Was he very emotional when he came upon the cache of papyri? “You know, when you are working like that all the day for one month you cannot realize at once what happens.”

Tallet has been toiling quietly on the periphery of the ancient Egyptian Empire—from the Libyan Desert to the Sinai and the Red Sea—for more than 20

The image shows a close-up of a fragment of an ancient papyrus scroll. The papyrus is a light brown color and is heavily damaged, with many tears and missing sections. Black ink hieroglyphs are written on the papyrus in several columns. Some of the hieroglyphs are large and stylized, while others are smaller. The text is arranged in vertical columns, reading from right to left. The fragment is part of a larger scroll, as indicated by the torn edges and the continuation of the text on the adjacent page (not fully visible).

Pierre Tallet (opposite) at the
Red Sea port of Ayn Soukhna.
A papyrus he found at Wadi
al-Jarf from 2,600 B.C., the
world's oldest (this page), re-
fers to the "horizon of Khufu,"
or the Great Pyramid at Giza.

years without attracting much notice, until now. He finds it both amusing and mildly annoying that his discoveries are suddenly attracting attention in the scholarly press and popular media. “It’s because the papyri are speaking of the Pyramid of Khufu,” he says.

We are standing in an encampment in a desert valley a couple of hundred yards from the Red Sea near the modern Egyptian resort town called Ayn Soukhna. Tallet and his crew—part French, part Egyptian—sleep in rows of tents set up near the archaeological site. Above the tents is a steep sandstone hillside into which the ancient Egyptians carved deep caves, or galleries, in which they stored their boats. Tallet leads us up the hillside and clammers on a rocky trail along the cliff face. You can see the outlines of a set of ancient Egyptian hieroglyphs carved delicately into the stone. There is the royal seal of Mentuhotep IV, a little-known pharaoh who ruled for just two years in about 2,000 B.C. And right below there are three lines of a hieroglyphic inscription proclaiming the achievements of the pharaoh, which Tallet translates: “In year one of the king, they sent a troop of 3,000 men to fetch copper, turquoise and all the good products of the desert.” On a clear day you can see the Sinai Desert about 40 miles away across the Red Sea from where we stand. Before these recent excavations, the ancient Egyptians were not widely known to be notable sea travelers, and were thought to confine themselves to moving up and down the Nile or hugging the Mediterranean coast. The work that Tallet and others have done in the last two decades has shown that the ancient Egyptian Empire was as ambitious in its outward reach as it was in building upward in its colossal monuments at Giza.

Tallet, a short, almost bald man of 49, wears wire-rimmed glasses and, on this day, a tan wool sweater vest. He looks like someone you would be more likely to encounter in a Paris library or office than in a desert camp. Indeed he is soft-spoken, choosing his words with scholarly scruple and carefully citing the contributions of other scholars, and



he likes working in remote locations far from the hubbub at the monumental sites, royal tombs and palaces and necropolises that have generally captured the world’s attention. “What I love are desert places,” he says. “I would not like to excavate places like Giza and Saqqara.” (Saqqara is where early Egyptian pharaohs built some of their tombs before beginning the pyramid complex at Giza.) “I am not so fond of excavating graves. I like natural landscapes.” At the same time, he has professional reasons for preferring remote sites over famous

monuments. “Most new evidence is found in the periphery,” he says.

Tallet’s taste for the periphery goes back to the beginning of his career. Tallet grew up in Bordeaux, the son of a high-school French teacher (his father) and a professor of English literature (his mother). After studying at Paris’ famous École Normale Supérieure, Tallet went to Egypt to do an alternative military service by teaching in an Egyptian high school; he stayed on to work at the French Institute, where he began his archaeo-



logical work. He scoured the edges of the Egyptian world—the Libyan desert on one end, the Sinai Desert on the other—looking for, and finding, previously unknown Egyptian rock inscriptions. “I love rock inscriptions, they give you a page of history without excavating,” he says. In the Sinai he also found abundant evidence that the ancient Egyptians mined turquoise and copper, the latter essential for making weapons as well as tools. This, in turn, fit with his discovery of the harbor at Ayn Soukhna that the Egyptians would

Excavators at Ayn Soukhna uncovered dwellings, a copper workshop, ships’ remains and stone inscriptions. One cited an “inspector of carpenters”—a sign of a busy port thousands of years ago.

~~~~~  
have used to reach the Sinai. “You see,” he says, “there is a logic in things.”

The area was not recognized as an ancient Egyptian site until 1997 when the cliffside hieroglyphs were noted by an Egyptian archaeologist. Ayn Soukhna has gradually become a popular weekend destination, and since the construction of a larger, faster highway

about ten years ago, it is now only about a two-hour drive from Cairo. Across the road from Tallet’s site is an older Egyptian hotel closed for renovation, which allows his crew to work in peace, sifting through the area between the boat galleries up in the hillside and the sea. They are finding the remains of ovens for smelting copper and preparing food as well as quotidian objects such as mats and storage pots.

Sixty-two miles south of Ayn Soukhna, along the Red Sea coast, is Tallet’s second archaeological site, at Wadi al-Jarf, and it’s even more obscure. Among the only landmarks in the vicinity is the Monastery of Saint Paul the Anchorite, a Coptic Orthodox outpost founded in the fifth century near the cave, which had been inhabited by their hermitic patron saint. The area is almost the definition of the middle of nowhere, which is probably why it long failed to attract the attention of either archaeologists or looters. The remoteness also helps explain why the papyri left in the desert there survived for thousands of years. Precisely because administrative centers like Memphis and Giza were occupied and reused for centuries—and then picked over or looted repeatedly in the intervening millennia—the survival rate of fragile papyri from the early dynasties there has been close to zero.

Among the few people to take note of the place before Tallet was the British explorer John Gardner Wilkinson, who passed by in 1823 and described it in his travel notes: “Near the ruins is a small knoll containing eighteen excavated chambers, beside, perhaps, many others, the entrance of which are no longer visible. We went into those where the doors were the least obstructed by the sand or decayed rock, and found them to be catacombs; they are well cut and vary from about 80 to 24 feet, by 5; their height may be from 6 to 8 feet.”

Perhaps associating the area with the monastery, Wilkinson took the gallery complex to be a series of catacombs. But the description of this series of carefully cut chambers carved into the rock sounded to Tallet exactly like the boat storage galleries he was busy ex-



# Kingdom Come

The Old Kingdom pyramids not only required a tremendous amount of material and manpower. New research shows that the builders were even more enterprising than previously thought—mining and transporting goods hundreds of miles from the capital.

BY 5W INFOGRAPHICS • RESEARCH BY SONYA MAYNARD

## THE GOODS

Tens of thousands of laborers at the pyramids relied on shipments from the Red Sea and beyond.

- Livestock
- Grain
- Wine
- Olives
- Wood
- Papyrus reed
- Copper
- Gypsum
- Granite
- Limestone
- Alabaster
- Stone tools
- Resin
- Pottery
- Maps

Cedar  
Cypress  
Oak  
Olive  
Pine

Domesticated around 3,000 B.C., donkeys (not camels) hauled supplies to Giza, often in long trains.



0 MILES 30

Suez Canal  
(built in 1869)

NILE  
DELTA

PRESENT  
DAY CAIRO

**TURA**

To obtain the white limestone that encased the pyramids of Khufu (an area of some 21 acres) and Khafre, quarry workers used copper tools to cut large blocks and hauled them on massive sleds.

**MEMPHIS**

**GIZA PLATEAU**

On a one-square-mile rise overlooking Memphis, the capital, are the famed monuments to Egypt's fourth dynasty, 2613 to 2494 B.C., an age of uncommon political stability.

NILE

## A HARBOR IN THE DESERT

Today the Giza Plateau is a desert, but a harbor, linked to the Nile by canals, served Old Kingdom pharaohs, says Mark Lehner. At high flood, cargo ships could approach pyramid building sites.

Khufu  
Pyramid

Khafre  
Pyramid

Sphinx

Khafre  
Basin

Workers  
barracks

Khufu  
Causeway

Khufu  
Marina

Nile  
levee

Nazlet  
el-Sissi

Nazlet  
el-Batran  
East





## ANCIENT DRY DOCK

Ten feet wide, as long as 112 feet, some 30 galleries carved out of rock held dismantled boats. Large sandstone rocks served as doors. Researchers have found remnants of oars, ropes and sails, as well as hieroglyphs that tie the site to the Old Kingdom.



### SINAI PENINSULA

#### AYN SOUKHNA

Official inscriptions and other evidence indicate that the port was active over 1,000 years, beginning in the Old Kingdom, and received copper and turquoise from the Sinai.

#### AL-MARKHA

#### COPPER MINES

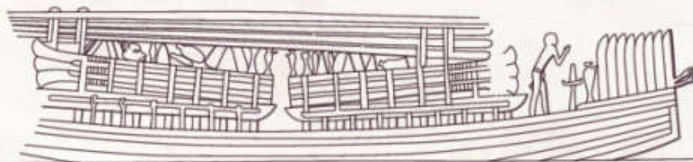
The pyramid builders needed large amounts of copper, believed to be the hardest metal then available, for the chisels and picks with which they quarried and shaped stones.

#### WADI AL-JARF

The world's oldest known port, active during Khufu's reign, held a wharf, tower and a mysterious 200-by-100-foot stone building, the largest Red Sea structure in pharaonic times.

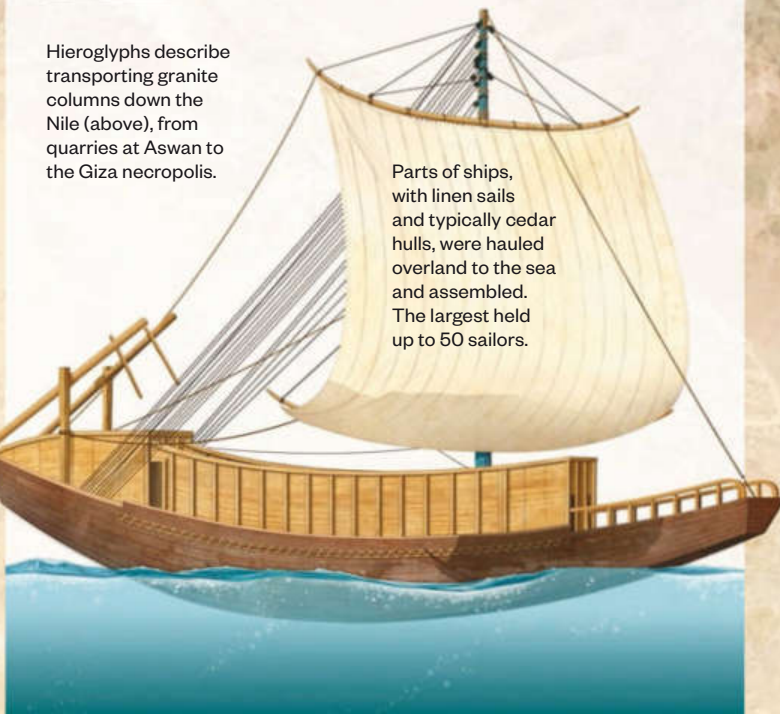
## THE BOATS

Experts once believed that Old Kingdom Egyptians had little use for sea-faring boats. But research suggests they sailed to Sinai and perhaps ventured hundreds of miles in the Red Sea for priestly goods such as leopard skins.



Hieroglyphs describe transporting granite columns down the Nile (above), from quarries at Aswan to the Giza necropolis.

Parts of ships, with linen sails and typically cedar hulls, were hauled overland to the sea and assembled. The largest held up to 50 sailors.



### NILE RIVER

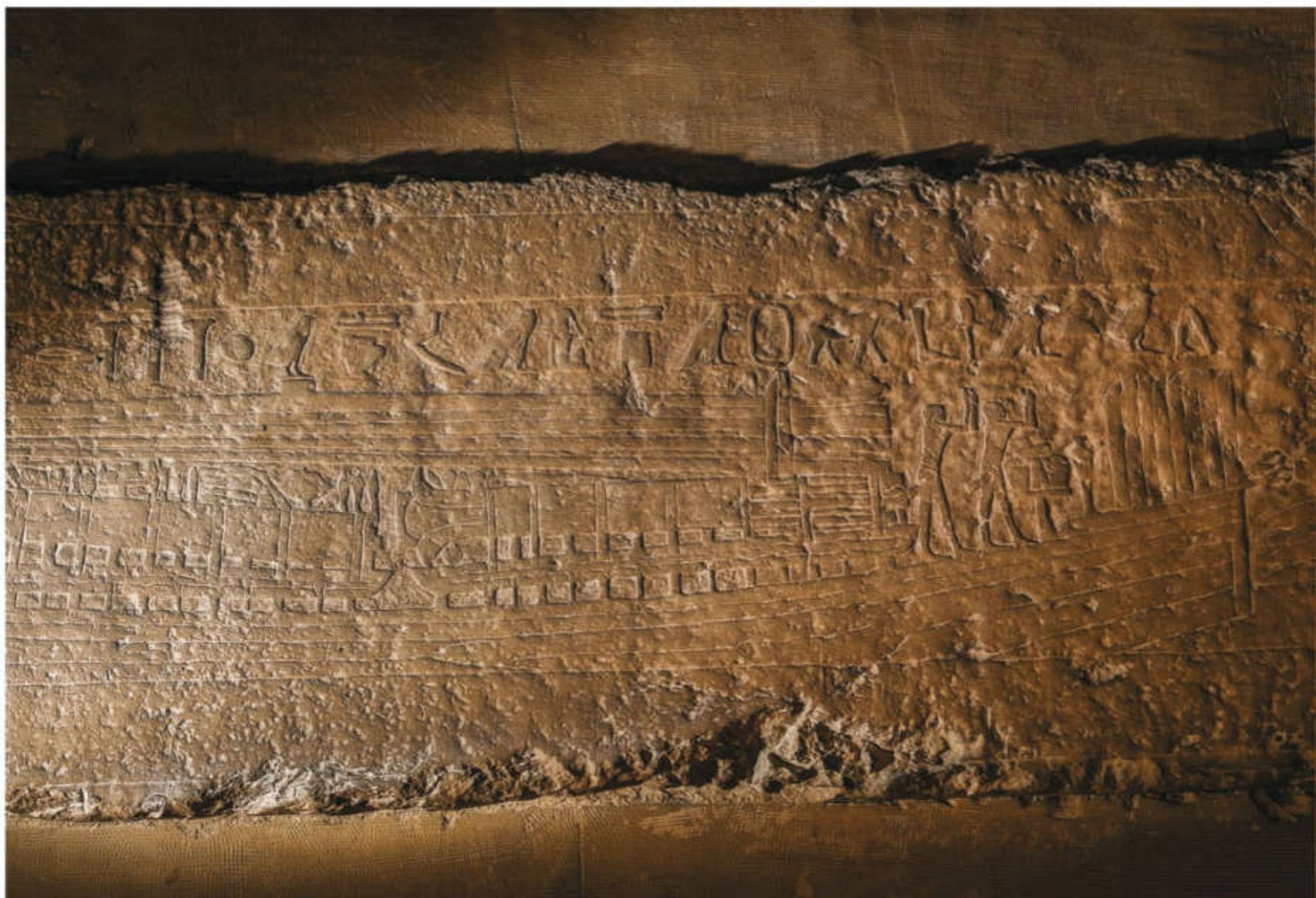
#### Nile levee

#### WATER LEVEL

At flood peak (August-Sept.)

At low water (April-May)





cavating at Ayn Soukhna. (They also looked like the galleries at another ancient port, Mersa Gawasis, then being excavated by Kathryn A. Bard of Boston University and Rodolfo Fattovich of the University of Naples L'Orientale.) Moreover, two French pilots who were based in the Suez Gulf in the mid-1950s had noted the site, but didn't associate it with the harbor. Tallet tracked down one of the pilots and, using his notes, Wilkinson's description and GPS technology, figured out the location. It was two years later that Tallet and his crew began clearing out a small passageway at the entrance to the boat galleries, between two large stone blocks that had been used to seal the caves. Here they found entire papyrus scrolls, including Merer's journal. The ancients, Tallet says, "threw all the papyri inside, some

of them were still tied with a rope, probably as they were closing the site."

Wadi al-Jarf lies where the Sinai is a mere 35 miles away, so close you can see the mountains in the Sinai that were the entry to the mining district. The Egyptian site has yielded many revelations along with the trove of papyri. In the harbor, Tallet and his team found an ancient L-shaped stone jetty more than 600 feet long that was built to create a safe harbor for boats. They found some 130 anchors—nearly quadrupling the number of ancient Egyptian anchors located. The 30 gallery-caves carefully dug into the mountainside—ranging from 50 to more than 100 feet in length—were triple the number of boat galleries at Ayn Soukhna. For a harbor constructed 4,600 years ago, this was an enterprise on a truly grand scale.

Yet it was used for a very short time. All the evidence that Tallet and his col-

leagues have gathered indicates that the harbor was active in the fourth dynasty, concentrated during the reign of one pharaoh, Khufu. What emerges clearly from Tallet's excavation is that the port was crucial to the pyramid-building project. The Egyptians needed massive amounts of copper—the hardest metal then available—with which to cut the pyramid stones. The principal source of copper was the mines in the Sinai just opposite Wadi al-Jarf. The reason that the ancients abandoned the harbor in favor of Ayn Soukhna would appear to be logistical: Ayn Soukhna is only about 75 miles from the capital of ancient Egypt. Reaching Wadi al-Jarf involved a considerably longer overland trip, even though it was closer to the Sinai mining district.

After visiting Wadi al-Jarf, Lehner, the American Egyptologist, was bowled over by the connections be-



See more of David Degner's  
Egyptian photographs at  
[Smithsonian.com/pyramid](http://Smithsonian.com/pyramid)





tween Giza and this distant harbor. “The power and purity of the site is so Khufu,” he said. “The scale and ambition and sophistication of it—the size of these galleries cut out of rock like the Amtrak train garages, these huge hammers made out of hard black diorite they found, the scale of the harbor, the clear and orderly writing of the hieroglyphs of the papyri, which are like Excel spreadsheets of the ancient world—all of it has the clarity, power and sophistication of the pyramids, all the characteristics of Khufu and the early fourth dynasty.”

Tallet is convinced that harbors such as Wadi al-Jarf and Ayn Soukhna served mainly as supply hubs. Since there were few sources of food in the Sinai, Merer and other managers were responsible for getting food from Egypt’s rich agricultural lands along the Nile to the thousands of men working in the Sinai mine fields, as well as

**A vast burial site near Giza that predates the Great Pyramid, the Saqqara complex (above) held a stone inscription depicting the transport of large columns by boat (left)—rare evidence of the actual building methods used by ancient Egyptians.**

retrieving the copper and turquoise from the Sinai. In all likelihood, they operated the harbor only during the spring and summer when the Red Sea was relatively calm. They then dragged the boats up to the rock face and stored them in the galleries for safekeeping until the next spring.

Ancient Egypt’s maritime activities also served political and symbolic purposes, Tallet argues. It was important for the Egyptian kings to demonstrate their presence and control over the whole national territory, especially its more remote parts, in order to assert the essential unity of Egypt. “Sinai had great symbolic importance for them as it was one of the farthest points they could reach,” Tallet

says. “In the Sinai the inscriptions are explaining the mightiness of the king, the wealth of the king, how the king is governing its country. On the outer limits of the Egyptian universe you have a need to show the power of the king.”

In fact, their control of the periphery was rather fragile. Distant and inhospitable Sinai, with its barren landscape and hostile Bedouin inhabitants, represented a challenge for the pharaohs; one inscription records an Egyptian expedition massacred by Bedouin warriors, Tallet says. Nor were the Egyptians always able to hold on to their camps along the Red Sea. “We have evidence from Ayn Soukhna that the site was destroyed several times. There was a big fire in one of the galleries. . . . It was probably difficult for them to control the area.”

Apparently all parts of Egypt were involved in the great building project at Giza. Granite came from Aswan far to the south, food from the delta in the

# PYRAMID SCHEME

The secret of the shine

**I**F YOU THINK IT'S SOMETHING to behold now, you should have seen the Great Pyramid of Giza back in the day. Before air pollution and the elements darkened its surface and looters pried off the outer casing, exposing jagged edges and a stone underlayer as bumpy as a cobbled street, the Great Pyramid was so bright and smooth it was almost blinding, says Jacquelyn Williamson, an Egyptologist at Harvard's Semitic Museum, who appears in the Smithsonian Channel's "Secrets: Great Pyramid." The key to the pyramid's ethereal glow was its casing: 2.4 million cubic feet of Tura limestone. Workers carefully shaped the ultrawhite limestone into neat blocks and set them in place on the pyramid. Then they evened the stones with small chisels, perhaps polishing them with sandstone or quartzite bricks and wet clay, smoothing tool marks and heightening the shine. The effect was "stunning," says Williamson (below). And for good reason. "These monuments were meant to be a testament to the pharaoh's divine ability to give order and beauty to the world he lived in," she says. —KATIE NODJIMBADEM

"Secrets: Great Pyramid" airs on October 17.



north near the Mediterranean, and limestone from Tura, about 12 miles south of Cairo on the Nile. The burst of maritime activity was also driven by the monumental undertaking. "It is certain that the shipbuilding was made necessary by the gigantism of the royal building projects," Tallet writes in a recent essay, "and that the great majority of the boats were intended for the navigation of the Nile and the transport of materials along the river, but the development of Wadi al-Jarf exactly in the same period allows us to see without doubt the logical extension, this time toward the Red Sea, of this project of the Egyptian state."

Working on the royal boats, it seems, was a source of prestige. According to the papyri found at Wadi al-Jarf, the laborers ate well, and were provisioned with meat, poultry, fish and beer. And among the inscriptions that Tallet and his team have found at the Wadi al-Jarf gallery complex is one, on a large jar fashioned there, hinting at ties to the pharaoh; it mentions "Those Who Are Known of Two Falcons of Gold," a reference to Khufu. "You have all sorts of private inscriptions, of officials who were involved in these mining expeditions to the Sinai," Tallet says. "I think it was a way to associate themselves to something that was very important to the king and this was a reason to be preserved for eternity for the individuals." Clearly these workers were valued servants of the state.

The discovery of the papyri at such a distant location is significant, Tallet says: "It is not very logical that [the writings] should have ended up at Wadi al-Jarf. Of course [the managers] would have always traveled with their archives because they were expected always to account for their time. I think the reason we found [the papyri] there is that this was the last mission of the team, I imagine because of the death of the king. I think they just stopped everything and closed up the galleries and then as they were leaving buried the archives in the area between the two large stones used to seal the complex. The date on the papyri seems



to be the last date we have for the reign of Khufu, the 27th year of his reign."

The work that Tallet and his colleagues have done along the Red Sea connects with Lehner's work at Giza. In the late 1980s, Lehner began a full-scale excavation of what has turned out to be a residential area a few hundred yards from the pyramids and the Sphinx. For centuries, travelers had contemplated these amazing monuments in splendid isolation—man-made mountains and one of the world's great sculptures sitting seemingly alone in the desert. The paucity of evidence of the substantial number of people needed to undertake this massive project gave rise to many bizarre alternative theories about the pyramids (they were built by space aliens,





by the people from Atlantis and so forth). But in 1999, Lehner began uncovering apartment blocks that might have housed as many as 20,000 people.

And many of the Giza residents, like the boatmen at the Red Sea, appear to have been well-fed. Judging by remains at the site, they were eating a great deal of beef, some of it choice cuts. Beef cattle were mostly raised in rural estates and then perhaps taken by boat to the royal settlements at Memphis and Giza, where they were slaughtered. Pigs, by contrast, tended to be eaten by the people who produced the food. Archaeologists study the “cattle to pig” ratio as an indication of the extent to which workers were supplied by the central authority or by their own devices—and the higher the ratio, the

**Sculpted in place from limestone, the Sphinx, according to Mark Lehner and others, was most likely built for Khufu's son, Pharaoh Khafre. His pyramid is visible in the background.**

more elite the occupants. At Lehner's “Lost City of the Pyramids” (as he sometimes calls it), “the ratio of cattle to pig for the entire site stands at 6:1, and for certain areas 16:1,” he writes of those well-stocked areas. Other, rather exotic items such as leopard's teeth (perhaps from a priest's robe), hippopotamus bones (carved by craftsmen) and olive branches (evidence of trade with the Levant) have also turned up in some of the same places, suggesting that the people who populated Lehner's working village were prized specialists.

Sailors may have figured among

the visitors to the pyramid town, according to Merer's papyrus journal. It mentions carrying stone both up to the lake or basin of Khufu and to the “horizon of Khufu,” generally understood to refer to the Great Pyramid. How did Merer get his boat close enough to the pyramids to unload his cargo of stone? Currently, the Nile is several miles from Giza. But the papyri offer important support for a hypothesis that Lehner had been developing for several years—that the ancient Egyptians, masters of canal building, irrigation and otherwise redirecting the Nile to suit their needs, built a major harbor or port near the pyramid complex at Giza. Accordingly, Merer transported the limestone from Tura all the way to Giza by boat. “I think the Egyptians intervened in the flood plain as dramatically as they did on the Giza Plateau,” Lehner says, adding: “The Wadi al-Jarf papyri are a major piece in the overall puzzle of the Great Pyramid.”

Tallet, characteristically, is more cautious. “I really don't want to be involved in any polemics on the building of the pyramids at Giza—it's not my job,” he says. “Of course it's interesting to have this kind of information, it will deserve a lot of study.”

Tallet believes that the Lake of Khufu, to which Merer refers, was more likely located at Abusir, another important royal site about ten miles south of Giza. “If it is too close to Giza,” Tallet says, “one does not understand why it takes Merer a full day to sail from this site to the pyramid.” But Tallet has been persuaded by Lehner's evidence of a major port at Giza. It makes perfect sense, he says, that the Egyptians would have found a way to transport construction materials and food by boat rather than dragging them across the desert. “I am not sure it would have been possible at all times of the year,” he said. “They had to wait for the flooding, and could have existed for perhaps six months a year.” By his estimate the ports along the Red Sea were only working for a few months a year—as it happens, roughly when Nile floods would have filled the harbor at Giza. “It all fits very nicely.” ●





PHOTOGRAPHS BY  
**SEBASTIÃO SALGADO**

OPENING PHOTOGRAPH BY LUIZ MAXIMIANO



A woman with dark hair, wearing a red long-sleeved shirt and a necklace, stands in a field of tall, green grass. She is looking off to the side. In the background, there is a dense forest of green trees and bushes, with mountains visible in the distance under a blue sky with white clouds. The foreground is filled with tall, green grass and some thin, vertical stalks.

## SEEING THE FOREST AND THE TREES

Renowned photographer Sebastião Salgado documented human suffering around the world. Back in his native Brazil, he's healing the devastated landscape, and his own spirit, one tree at a time

BY MCKENZIE FUNK



# The spot Sebastião Salgado wants me to see is a few minutes up a fire road, on a ridge he used to reach on horseback.

We go there by SUV. The road is red dirt and the forest is young, but already its trees tower above us, and they cast a blessed shade. The legendary photographer, now 71, gestures out the window at the broccoli-top canopy of a *pau-brasil*, or brazilwood, the species after which his country is named. We grind uphill past a few *peroba*, a valuable hardwood that had been left uncut by his father, who bought this land in the 1940s. Salgado takes note of a patch of invasive *brachiaria* grass that has flared up in a sunny spot. The road jogs left, and suddenly we park.

A fence line traces the long ridge. Salgado holds open the barbed wire so I can slip under, then follows, in the process cutting his index finger, which he sticks in his mouth as we traverse the slope. We stop and take in the sweep of the land. The contrast is stark, almost too obvious. On one side of the fence,

his neighbor's ranch is a latticework of cow paths, its ankle-high grass yellowing in the sun, its steep slopes ripped by landslides because the trees are gone. The land's condition isn't helped by the fact that Brazil is in the throes of a megadrought, its worst in nearly a century. But on the other side, the side we came from, there is only green: replanted forest stretching as far as the eye can see.

Salgado and his wife, Lélia, call their side of the fence Instituto Terra. They don't own the property anymore. Today it's a federally recognized nature preserve and a nonprofit organization that raises millions of tree seedlings in its nursery, trains young ecologists and welcomes visitors to see a forest reborn. But it's also where Salgado grew up, a 1,750-acre former farm in the state of Minas Gerais 70 miles inland from Brazil's Atlantic coast, in the Maine-size valley of the Rio Doce, the Freshwater River. It was once remote. In the 1950s,



**Sebastião and Lélia (above), seen in the early 1970s, left Brazil for Paris in 1969 after their political activism made them targets of the military dictatorship. Two sons were born soon afterward. Top, Sebastião holds the elder, Julian, in 1974.**

its road to the outside world was a dirt track along the river that was muddy and impassable six months out of the year. Coffee came down from the hills via mule train. Ranchers drove cows and pigs to the slaughterhouse on horseback—a five-day ride. The Atlantic Forest, second in biodiversity only to the Amazon, with nearly as many tree species in a single acre as are found on the entire East Coast of the United States, covered half the farm and half the Rio Doce Valley.

Salgado had no camera then—he didn't take up the craft that would make him famous until his late 20s—but he believes this landscape first taught him photography. In the afternoons in the rainy season, thunderheads piled on top of each other and sunbeams pierced dramatically through. "It is here where I learned to see the light," he told me.

Gradually, Salgado's father, a stern man who was by turns a pharmacist, a





mule-train driver, a baker and a farmer, cut down the forest. Like farmers across Brazil, he sold the wood, burned the slash and planted African grasses to feed cattle. Over time crept a desert of cracked dirt that could barely support a single cowherd. The Atlantic Forest as a whole shrank to less than 10 percent of its original size; in the Rio Doce Valley, it shrank to 4 percent. In the 1980s, the year-to-year destruction of Brazil's forests was so severe that the whole world—newly empowered with satellite imagery—watched in horror, and the country became shorthand for a new era of global environmental decay.

Today the landscape has taken on another meaning. In the 1990s, Salgado's parents gave the land to Sebastião and Lélia, and they began to replant it. Instituto Terra is the Salgados' argument that ecological degradation need not be absolute. To visit the fence line at the top of the ridge—or to see aerial photos of the land taken

a decade apart, one “before” and one “after”—is to understand that a kind of miracle has taken place.

**Salgado left the farm** in 1959, when he was 15 years old, and got on a train. His destination was a boarding school in Vitória, a coastal city of about 85,000 at the end of the line. There he rented a house with a half-dozen schoolmates and took turns managing its meals and finances. He learned he was good with numbers. He met a girl, a sophisticated Vitória native named Lélia Wanick, who found the boy from the interior intriguing in part because he always wore the same clothes—a pair of khaki pants and a blue linen shirt—yet somehow kept them perfectly clean. (It turned out that Salgado's father, ever practical, had bought two big rolls of cloth, and Salgado arrived in the city with 15 identical pairs of pants and 24 identical shirts.)

Brazil was industrializing at a breakneck pace. Factories sprang up

**Salgado's work chronicling environmental destruction reveals the sad ironies of conservation policy. Above, Brazilian soldiers destroy illegally logged timber to make it useless on the black market.**

in Vitória and in the suburbs rising around it. Ships filled the port. Sebastião and Lélia watched as rural migrants flooded the city, becoming the bottom of the new economic pyramid—the new urban poor. Together with many of their friends the couple became leftists. In the wake of Brazil's 1964 coup, which began two decades of military dictatorship, they joined a Marxist-leaning political movement called Popular Action. They married and moved to São Paulo, where Salgado earned a master's degree in macroeconomics, an emerging field that he hoped would help solve his country's social ills. As the government's repression deepened, their friends and comrades were arrested. Some were tortured. Some disappeared.



“We knew it was getting dangerous,” Lélia says. “We could feel it.”

They fled Brazil in 1969 and settled in Paris, where Salgado began a PhD program in economics. Lélia, who had watched her Vitória transformed, studied architecture and urban planning. Salgado’s dissertation was about the economics of coffee, which led to a job with the International Coffee Organization in London, setting up agricultural development projects in Central and East Africa. This led to a series of trips to the continent, including months on plantations in Rwanda, a hilly, jungle-clad country he grew to profoundly love.

It was Lélia who first bought a camera, a Pentax Spotmatic II with a 50-millimeter lens. She planned to take pictures of buildings for her architecture studies, but within days Salgado was toying with it. His first photograph was of a young Lélia sitting in a windowsill. Soon he had set up a darkroom, and the Pentax went on his every trip to Africa. One Sunday in 1973, in a rowboat with Lélia on an artificial lake in London’s Hyde Park, Salgado decided to abandon economics to try to make a living as a photographer. He had just been offered a prestigious new job with the World

Bank. His father thought he was crazy. But already Salgado’s images conveyed so much more than the dull reports he was asked to write. “I realized the photos I was taking made me much happier,” he explains in *From My Land to the Planet*, a 2013 autobiography. He and Lélia would have to give up his salary, their beloved Triumph sports car and a nice London apartment. But she wholeheartedly agreed. This would be another adventure to embark on together. “It’s very hard to know where she ends and I begin,” he says today.

Back in Paris, they moved into a 150-square-foot apartment with no

**When they were first able to visit, they were shocked by its condition, the once fertile property, Salgado has written, a “bare crust.”**





shower. Salgado went to a local magazine and knocked on the door. “Hello, I’m a young photographer,” he recalls saying. “I want to make pictures. What do you need?” The editors laughed, but they showed him a list of planned stories. He went into the city’s slums and documented the lives of new arrivals from Portugal and North Africa. He drove to the north of France and photographed Polish immigrants laboring in the coal mines. After three days, he returned to the magazine. An editor flipped through the photos and stopped on one of a miner. “Not bad,” he said. “We’ll publish it.”

Salgado’s work always had a social documentary cast, and soon he was crisscrossing the globe—Niger, Mozambique, Australia, Bangladesh, Bolivia, Kuwait—on assignments for magazines. He traveled by jeep or on foot. He slept in huts and tent camps. To communicate with his family—his sons Juliano and Rodrigo were born in 1974 and 1979, respectively—he posted airmail and sent telegrams. With Lélia



Since its founding in 1998, Instituto Terra has replanted 1,700 acres on its land, seen “before,” in 2000 (left), and “after,” in 2013 (above). Below, Salgado tours the nursery, which raises a million seedlings a year, in his customary blue linen shirt.

he conceived and produced long-term projects that captured the human face of a world in transition: workers, migrants, victims of war and genocide and famine on five continents.

A Salgado photograph is instantly recognizable. Black-and-white. Biblical in scope. Human. Severe. Art critics often focus on what is in the foreground: a grimace, a twisted body made beautiful, suffering as art. But it’s his attention to the background that matters most. Salgado is a systems thinker, keenly aware of the larger forces that create the moments he captures. In his 1991 photos of a burning, post-invasion Kuwait, firefighters are framed by flaming oil wells set ablaze by departing Iraqi troops, symbols of an industry and region torn from its foundation.



**“Like to grow a baby. You need to teach it to walk, to speak, and then they can go to school on their own. Trees are the same.”**





**Salgado's love for his native Brazil has led him to many projects showing endangered ways of life. In 2013, he photographed the Awá, who live closely with animals in the Amazon—especially monkeys, like the baby sagui at left.**

among his friends Prince Albert of Monaco, former Brazilian President Luiz Inácio Lula da Silva, and the late actor Robin Williams and his ex-wife Marsha, who raised the money for Instituto Terra's theater. *The Salt of the Earth*, a 2014 film about his life by his son Juliano and the director Wim Wenders, was nominated for an Oscar for best documentary and won a jury prize in Cannes. In Salgado's view, his success is simply a product of his time and place on earth. His great subjects—migration, dislocation, urbanization, globalization—have been his experiences, too. "People say Salgado is a social photographer, a political photographer," he told me. "But my work is just me, from my own life."

After the fall of Brazil's dictatorship, when he and Lélia could safely return home, Salgado spent years photographing the Landless Workers Movement—peasants who wanted to reclaim corporate-owned farmland as the country's economy changed. More recently, he went deep into the Amazon to capture the encroached lives of tribes like the Awá and Yanomami, whose traditional lands are being invaded by loggers and miners as Brazil continues to modernize. His latest book of photography, *The Scent of a Dream*, out this fall, is about coffee—its workers, its economy, its ecology. "Coffee has always been a part of my life," he explains.

In the mid-1990s, Salgado was in Rwanda and the Balkans, documenting genocide, surrounded by death. A dear friend in Rwanda—a colleague from his economist days—was murdered along with his wife and children. Salgado himself was almost killed by a machete-wielding mob. At the border with Tanzania, he watched dozens of corpses float down the Akagera River. In a cholera-stricken refugee camp, he watched aid workers build a mountain

of bodies with a bulldozer. When he returned to Paris, he was physically and psychologically sick. What he had seen was "so shocking that at a certain point my mind and body started to give way," he wrote. "I had never imagined that man could be part of a species capable of such cruelty to its own members and I couldn't accept it." He had lost his faith in humanity, he told Lélia, and he had lost all desire to shoot photos.

**It wasn't long before** this that Salgado's parents had offered Sebastião and Lélia the old farm. When they were first able to visit, they were shocked by its condition, the once fertile property, Salgado has written, a "bare crust." Replanting it was Lélia's idea. She denies that her proposal to heal the land was actually an effort to heal her husband. "There was no hidden agenda," she told me. "It was so natural, instinctive. The land was so degraded, so horrible. What a bad gift! Why not plant?" But it's difficult not to see an emotional dimension in their efforts to bring back the forest.

In September 1998, the Salgados gave a tour of the farm to a forestry engineer named Renato de Jesus, who for two decades had run a replanting program for Vale, one of the world's biggest mining companies, a \$29 billion multinational corporation named after the valley of the Rio Doce. Vale's environmental record, which includes building a dam on the Rio Doce close to Instituto Terra that displaced hundreds of members of the indigenous Krenak tribe, is controversial. But under Brazilian law and the company's own corporate policy it must rehabilitate its many mines, and the degradation at strip mines is so severe that Vale's skill at reforestation is unmatched. Salgado's reaching out to Vale was purely pragmatic. "We are not radicals," Salgado says. "We're not in an ivory tower. We need everybody: companies, governments, mayors. Everybody."

The soil was dead, de Jesus told the Salgados. But he assured them it could be revived. "It must be understood that it is possible to recover any area," he told me. "What varies is the cost." So

"You have to understand people, societies, economics," he told me. "Some photographers are very good at framing pictures—they are amazing at it!—but they don't see the whole view."

In time Salgado would win nearly every major award in photojournalism, publish more than a half-dozen books, and have his work exhibited in the great capitals of the world. He has counted



de Jesus presented a plan. They hired some two-dozen workers, who attacked the invasive African grasses by hand and with metal tools. Salgado and Lélia secured a donation of 100,000 seedlings from Vale's nursery. The Salgados also went to governments and foundations worldwide to secure another key input: money.

When the rains returned in 1999, they worked their way up the valley, placing the seedlings roughly ten feet apart, 2,000 trees per hectare. Fig species, long-leaved *andá-açu*, Brazilian firetrees and other legumes were meant to grow fast and die young. This first phase would provide shade, trap moisture, give shelter to birds and insects—and help heal the soil by restoring depleted nitrogen. Many legumes are good at fixing nitrogen from the atmosphere, leaving it in the soil when they die and decompose. Af-

ter five or ten years, nature would take over at Instituto Terra.

"Like to grow a baby," Salgado told me. "You need to teach it to walk, to speak, and then they can go to school on their own. Trees are the same. You need to hold them close for a while."

But after that first planting, three-fifths of the seedlings died in the ground. "We made the holes too tight," Salgado explained. "For weeks I was sick—sick to see this disaster." They refocused: 40,000 trees had survived. The next year, they lost only 20 percent. By 2002, when the partnership with Vale ended, they were producing seedlings in their own nursery and were more experienced at planting; the annual loss today is typically 10 percent. De Jesus, who has since moved to a new company, credits the Salgados for not neglecting the maintenance phase that comes after re-

**The Awá are made up of some 450 members; 100 remain uncontacted. They have been called "Earth's most threatened tribe," as loggers destroy habitat and food sources, like the prized honey that villager Juritximitan is collecting at right.**

planting, as so many projects do. They built fire roads, doggedly fought invasives and used ant bait to keep armies of leaf-cutters at bay.

When, in 2005, Instituto Terra needed money, Salgado auctioned off a special-edition titanium Leica M7 that the camera maker had presented to him to commemorate the 50-year anniversary of its premier line. It went for \$107,500—a world record for a camera built after 1945. "One small camera, and we planted 30,000 trees," Salgado said. Big donors, including a Brazilian nature fund, a Brazilian cosmetics firm, provincial governments in Spain and Italy, and North American









The Yanomami, forest dwellers for thousands of years, are threatened by encroaching loggers, farmers and disease. Here members harvest cassava.







foundations and individuals gave millions to build roads and offices, housing and classrooms, a 140-person theater, a visitor center fashioned out of a former dairy, and a greenhouse that has grown 302 different native tree species. Other donors have underwritten training for local science teachers and an intensive ecology program for top graduates from the region, who live on-site. But when money runs short—as often it does when it comes to less splashy expenses, such as maintenance or employee salaries—the Salgados pay out of pocket.

I first met up with the Salgados at their oceanside home in Vitória, which now has 1.9 million people in its metro area. Then we took off for the interior. With me in the back seat of Salgado's SUV was Luiz Maximiano, a photographer from São Paulo. Salgado plugged in an iPod and soon Beethoven's Piano Concerto No. 5 was blasting inside the car. The city faded behind us. Clouds hung between forested, steep-walled crags of granite. "Mac, look at these mountains," Salgado said. "Beautiful!" Lélia, who has a raspy voice and a gaze just as firm as her husband's, was in the front passenger seat. She hummed along to the Beethoven, conducted in the air with her hands, and gestured out the window.

Mostly, we didn't talk. Salgado was too focused on the two-lane road, Lélia too focused on his driving. He began tailgating a white Chevy Cruze, then passed it in a burst of ill-advised acceleration. He roared around a curve at almost 90 miles an hour. When she put her hand on his arm, he backed off slightly. We passed a man riding a horse. A long Vale train, mostly empty of iron ore after a trip to port, rum-

**Forest spirits are an integral part of Yanomami belief. At right, a man participates in a religious ritual after inhaling hallucinogenic yâkoana powder, made from a mixture of local plants, like the bark of the virola tree.**

bled back inland. Past a coffee plantation—"Robusta," Salgado declared—the voice of Luciano Pavarotti came over the stereo, singing "O Sole Mio." Salgado turned up the music and made a wild pass of a pickup truck.

"On the scale of Brazilian drivers, is Sebastião typical?" I later asked Luiz. He looked at me like I was crazy. "No," he said. "I thought we were going to die." But we didn't die. When we turned up a cobblestone road and entered Instituto Terra, it was dark out, and Handel's "Hallelujah" chorus was playing. Lélia sang along, laughing. When we opened the doors, in came a burst of forest air, sweet-smelling and humid and filled with the sounds of cicadas and running water.

In the morning, Salgado, who was wearing his standard blue button-down shirt, plus khaki shorts and flip-flops, gave Luiz and me a tour. In the administration office, he noticed that a framed picture—a black-and-white he shot decades ago of a truck in the Andes, filled with migrants, careening around a corner—was crooked. "The people might fall out," he joked, and an employee quickly righted it. As we walked, he saw a missing tile in a pathway, which he later reported to a groundskeeper. In the visitor center we were surrounded by some of his most famous images. Every time he visits Instituto Terra, the staff brings out a pile of posters and books for him to sign: more fundraising help. What do the posters sell for? Salgado asked a woman at the front desk.



# They experienced the creek's return as a new sound amid the wind and birdsong. "We started to have caimans again!"





Unsigned, she answered, about \$16. Signed, \$19. There was an awkward pause. “Cheap signature,” Salgado said.

As much as Instituto Terra has taken from Salgado, it has also given back. In 2002, after the seedlings took root, he wanted to be a photographer again. That year he set out on an eight-year project to document untram-

meled nature at the farthest reaches of the world. It became a celebrated book, *Genesis*, a traveling exhibition and a worldwide cultural moment. While in some respects it was a departure from Salgado’s past work—the abundance of nature in place of the wars and trials of humankind—in one key regard it wasn’t different at all.

It was a reflection of his own life and experience, projected onto the world.

**The Salgados waited ten years** for the creek that Sebastião had played in as a boy to come back to life. They experienced its return as a new sound amid the wind and birdsong, the drip-drip-drip of a waterfall that now tumbles



Salgado has documented many indigenous tribes and their traditions. Here, men are decorated with feathers and paint for a *reahu* funerary ceremony.









down the hill even in the dry season, even during the drought. “We started to have caimans again!” Salgado says.

The replanting of the land, it turned out, led to the development of a technique that seems singularly suited for combating the drought. The idea is simple. They could capture rain and runoff by strategically planting trees at the headwaters of springs and creeks. Healthy soil absorbs precipitation; hard, dead soil rejects it and sends it rushing downhill. Aboveground, branches and leaves slow rainfall, so it doesn’t hit the ground running. De Jesus says forest area can absorb up to 60 percent of the rain that falls. From this perspective, Brazil’s water crisis is in large part a storage problem. Because the Atlantic Forest is almost gone, water flows too quickly to the sea.

The institute’s latest initiative, Olhos d’Água, or Eyes of Water, aims to restore headwaters throughout the Rio Doce Valley, and the institute has signed an agreement with the state of Espírito Santo and the multinational steel company ArcelorMittal to expand Olhos to a thousand new springs. The institute’s employees are now fanning out across the basin to convince local farmers to plant trees and put cattle fences around the springs on their property to protect them. Nothing is more damaging to a spring, Salgado explains, than letting cows use it as a watering trough. “When an 800-kilo cow steps with one foot, that can be 200 kilos pounding the soil,” he says. “Boom, boom, boom—they trample it. They compact it.” Then nothing can grow, and the water is lost. The institute provides the wire fencing and wooden posts along with 400 seedlings per spring. The farmers do the work.



**“The big problem with our species is that when we live a long time, it’s only a hundred years. We can’t imagine in thousands of years.”**





**At left, women at a dwelling use fruit from the urucu plant and genipap tree to paint their bodies for a *reahu* ceremony. Yanomami communal dwellings can house as many as 400 people, with a central area for feasts, rituals and games.**

The result, in time, will be thousands of miniature forest preserves—miniature Instituto Terras.

One afternoon, Salgado and Lélia joined a graduate of the institute's ecology school at the Olhos pilot site he oversees. The water source is on a hillside at a small farm at the end of a long red-dirt road, an hour at Sal-

gado speed from the nearest town. The farm's owner, Idario Ferreira dos Santos, is a slight 71-year-old who was born nearby. "I've never seen a drought like this," he told us.

He led us up a steep path, past the weathered carcass of a cow, to a fence and a lonely patch of forest that filled a ravine. There wasn't much to see,

but when we descended to dos Santos' home, where he and his wife gave us guava juice and homemade cheese in the shade of the barn they built and the garden they planted, we saw what it was to him and his family: hope that they could stay there. Two large ponds, where they used to raise fish, were dry. A nearby stream was inches deep. "But the volume of water is growing," dos Santos said. "Before, there was none."

The drive back to Instituto Terra was under the same puffy thunderheads that defined Salgado's childhood. We rolled through scrublands across a collapsed caldera—you can see it, he said, on Google Earth—and past a wall of granite hundreds of feet high. There was a coffee plantation, then a coconut farm, then a herd of bulls and beef cattle in a sickly pasture.

If farmers and officials can be patient, Salgado believes, working to restore the watershed even if the water itself won't return for a decade, Olhos will be a success. "The big problem with our species," he said quietly, "is that when we live a long time, it's only a hundred years. We can't imagine in thousands of years." He reflected on the meaning of Instituto Terra. On the scale of Brazil and the world, it is small, he readily admitted—just a showcase. But its revival, along with his own over the same period, is a reminder of the power of taking the long view.

Past an assortment of boulders of marble, not yet mined, we found ourselves crossing the Rio Doce on an old bridge. The Salgados stared out the windows in silence. The water was brown, the banks sandy and wide. The river flowed with less than half its usual volume. If nothing was done, much of it could someday vanish under the mud. But for now the Rio Doce was still easily 500 feet across, and it took us a reassuringly long time to reach the other side. It wasn't too late. ○



# SHADES OF GRAY

Unable to survive in the wild but not  
domesticated either, captive-born  
gray wolves prowl an evolutionary  
shadowland at a sanctuary  
in Washington State





photographs by  
**Annie Marie  
Musselman**

text by  
**John Vaillant**

# T

## here is no recess of the human

consciousness that doesn't have a canid lurking in it somewhere. In the Northern Hemisphere, wherever humans showed up, some version of the wolf was already there, challenging and informing us, shaping our perception of the world. Banded together like early humans into small, mobile clans, with similar appetites, a soulful intelligence and an organizational style that has been favored (or was it imitated?) by hunting parties, guerrillas, platoons and street gangs across time, wolves have alternately fascinated and alarmed us. How could they not? Sharing landscapes and prey, along with a capacity for appalling savagery, we kept an eye on each other, and our ancestors were struck by the similarities: In addition to working collaboratively, wolves sing and often mate for life. Recent research reveals that they can be more cooperative than dogs, they follow each others' gaze and they communicate with facial expressions. They also scare the daylights out of us.

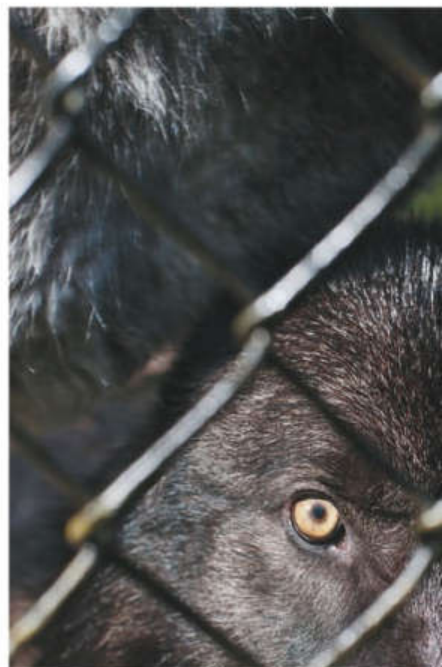
In all these ways, the wolf functions as a kind of companion consciousness, a wild and stealthy cousin so different from us in appearance and yet so like us in character. Annie Marie Musselman's photographs—portraits, really—capture this duality. Seeing them makes it easier to imagine how, long ago—before agriculture, the written word and organized religion—some of these creatures were invited to cross the threshold between shadow and firelight and enter the human sphere. With that invitation, according to one scientific hypothesis, humans were able to out-hunt the Neanderthals and thus came to dominate the planet. Still, no one could have predicted the depth and empathy of our alliance with the wolf's domesticated kin. Genomic evidence reported

this year shows that domestic dogs split from wolves as early as 40,000 years ago (around the time we started making art, and thousands of years earlier than some people had thought), but the lines are still blurred in a number of breeds, including



Siberian huskies. Today, the canids remain our closest link to our prehistoric selves. Our ambivalence toward them (those eyes, those teeth) resonates like an echo of that dangerous, formative time. Wolves are also a mirror; communal and bloodthirsty both, they reflect our own double-edged nature. As the saying goes, "Man is a wolf to man."

● | See more of Musselman's photos at [Smithsonian.com/wolf](http://Smithsonian.com/wolf)







Situated on 80 acres in western Washington, Wolf Haven International has rescued close to 170 gray wolves that belonged to breeders and roadside zoos or had no home. The sanctuary, opened in 1982, has also housed red wolves, coyotes and dozens of wolf dogs. "It's weird to say," observes Annie Marie Musselman, who has photographed the canids for several years, "but they are gentle." Unless, of course, a raven lands in an enclosure (bottom right).





In the wild, wolves tend to live with up to 15 members of an extended family. But at the sanctuary, where few animals are related and many were previously abused or neglected, they don't form packs. Riley, a timid gray wolf who died last year, came to Wolf Haven after his rescue from a backyard kennel.



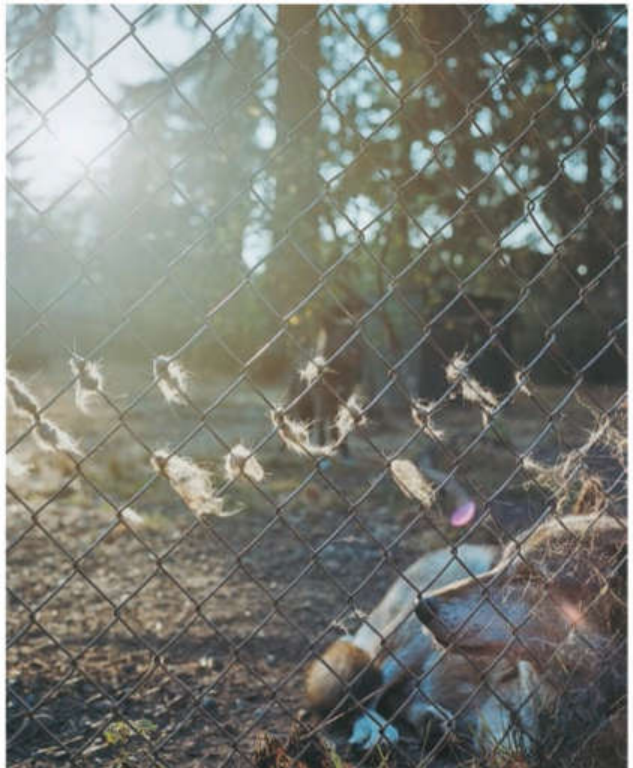








Gray wolves and dogs are both members of the species *Canis lupus*, and when they mate, their offspring are fertile. Lonnie (far left), a gray wolf that was found roaming a cemetery in Los Angeles, shares an enclosure with Meeka, a wolf-dog mix from a rescue center in the Mojave Desert. Although Meeka is spayed, “they are lovers for sure,” says Musselman. Rocco (below), a gray wolf, was raised as a pet in Seattle before arriving at Wolf Haven.





A photograph of a forest floor. The ground is covered with dry leaves, twigs, and patches of green moss. In the background, there are many thin, bare tree branches and a few thicker tree trunks. On the right side of the image, the thick, gray fur of a wolf's tail is visible, extending from the edge into the frame. The lighting is soft and natural, suggesting a forest environment.

Like most of the animals in the sanctuary, Shadow, a 5-year-old gray wolf who lived with a high-school security guard, is neither tame nor wild. "They're caught between two worlds," says Wendy Spencer, director of animal care. "Some of them cannot find a balance."













Something has put Lonnie, who has lived at Wolf Haven for six years, on alert. Wolves can smell an odor a mile away and hear another wolf howl across four miles. "I see them as who we were, or should be," Musselman says. "We should be more in touch with our senses and our surroundings." O

In a new memoir, one of  
Hemingway's closest friends reveals  
how the great writer grappled with  
the love affair that changed his  
life and shaped his art

---

---



H E M I N G W A Y  
L O V E

BY  
A.E. HOTCHNER  
ILLUSTRATION BY  
VIVIENNE FLESHER

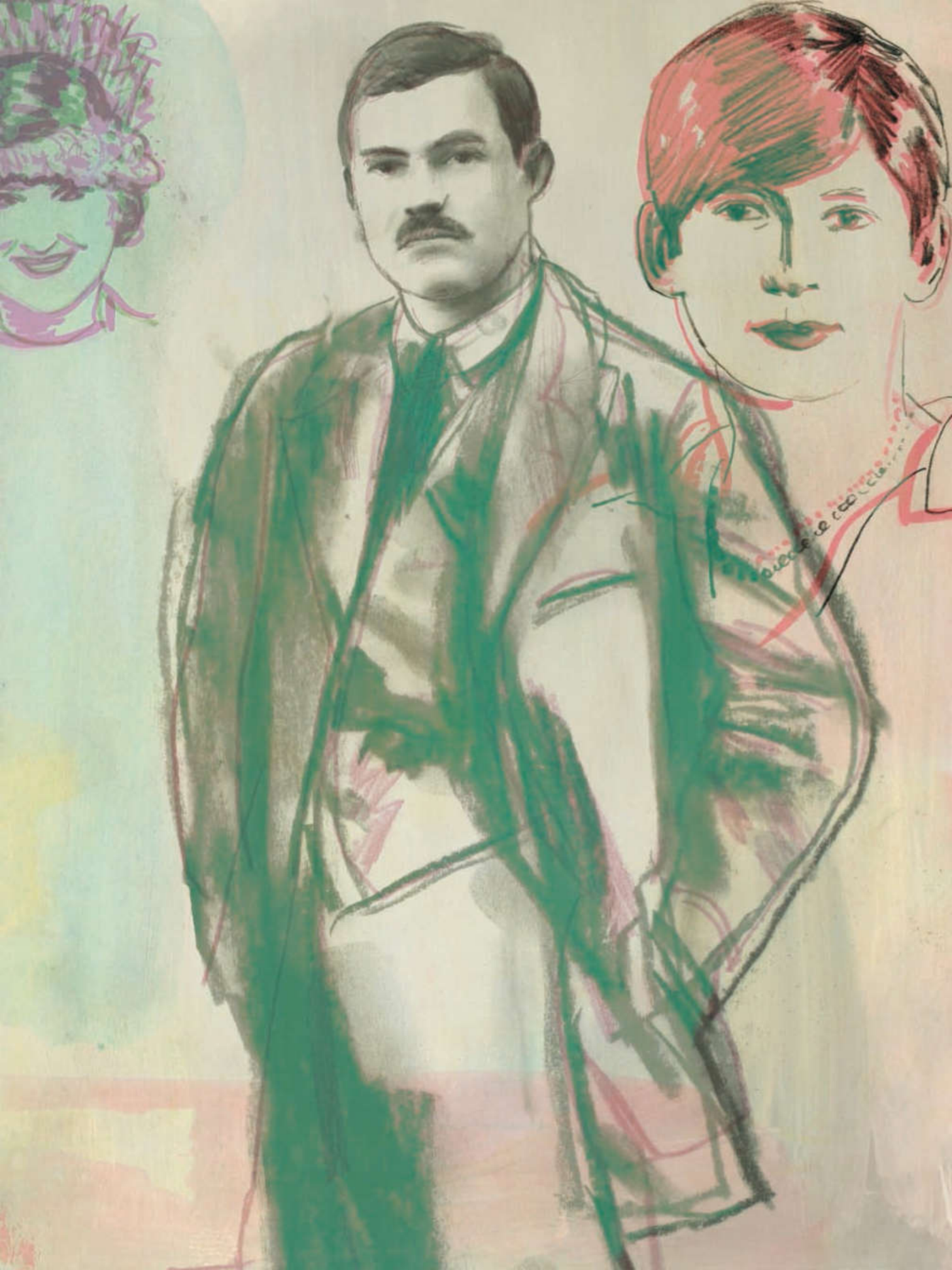
---

---

**IN THE SPRING OF 1948, I WAS DISPATCHED TO** Havana on the ridiculous mission of asking Ernest Hemingway to write an article on “The Future of Literature.” I was with *Cosmopolitan*, then a literary magazine, before its defoliation by Helen Gurley Brown, and the editor was planning an issue on the future of everything: Frank Lloyd Wright on architecture, Henry Ford II on automobiles, Picasso on art, and, as I said, Hemingway on literature.

Of course, no writer knows the future of literature beyond what he'll write the next morning. Checking into the Hotel Nacional, I took the coward's way out and wrote Hemingway a note, asking him to please send me a brief refusal. Instead of a note, I received a phone call the next morning from Hemingway, who proposed five





o'clock drinks at his favorite Havana bar, the Floridita. He arrived precisely on time, an overpowering presence, not in height, for he was only an inch or so over six feet, but in impact. Everyone in the place responded to his entrance.

The two frozen daiquiris the barman placed in front of us were in conical glasses big enough to hold long-stemmed roses.

"Papa Dobles," Ernest said, "the ultimate achievement of the daiquiri maker's art." He conversed with insight and rough humor about famous writers, the Brooklyn Dodgers, who held spring training in Cuba the previous year, actors, prizefighters, Hollywood phonies, fish, politicians, everything but "The Future of Literature."

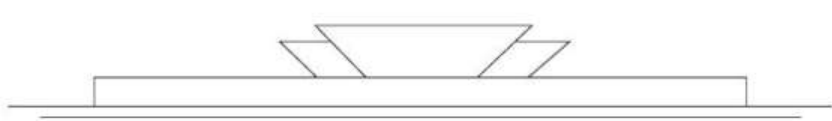
He left abruptly after our fourth or fifth daiquiri—I lost count. When I got back to the hotel, despite the un-

soon after use, I found them helpful.

Ernest and his wife, Mary, and I stayed in touch for the next eight months. That was the beginning of our friendship.

Over the following years, while we traveled, he relived the agony of that period in Paris when, married to his first wife, Hadley Richardson, he was writing *The Sun Also Rises* and at the same time enduring the harrowing experience of being in love with two women simultaneously, an experience that would haunt him to his grave.

I have lived with Ernest's personal story for a long time. This is not buried memory dredged up. The story he recounted was entrusted to me with a purpose. I have held that story in trust for these many years, and now I feel it is my fiduciary obligation to Ernest finally to release it from my memory.



HE REFILLED HIS WINEGLASS.

I passed.

"YOU EVER LOVED TWO WOMEN  
AT THE SAME TIME?"

I said I hadn't.

"LUCKY BOY," HE SAID.

steadiness of my pen, I was able to make some notes of our conversation on a sheet of hotel stationery. For all the time I knew him, I made a habit of scribbling entries about what had been said and done on any given day. Later on, I augmented these notes with conversations recorded on my Midgetape, a minuscule device the size of my hand, whose tapes allowed 90 minutes of recording time. Ernest and I sometimes corresponded by using them. Although the tapes disintegrated

**It was on the morning** of January 25, 1954, that word flashed around the world that Ernest and Mary had been killed in a plane crash in dense jungle near Murchison Falls in Uganda, setting off universal mourning and obituaries. But news of the tragedy was soon superseded by a report that Ernest had suddenly, miraculously, emerged from the jungle at Butiaba carrying a bunch of bananas and a bottle of Gordon's gin. A few hours later, a de Havilland Rapide, a 1930s-era biplane, was sent

to the crash site to fly Ernest and Mary back to their base in Kenya, but the de Havilland crashed on takeoff and burst into flames; it was that second crash that left its mark on Ernest.

Not long after, when I got to his corner room at the Gritti Palace hotel in Venice, Ernest was sitting in a chair by the window, tennis visor in place, reading his worldwide obituaries from a stack of newspapers on the desk beside him. "Right arm and shoulder dislocated," he said, "ruptured kidney, back







gone to hell, face, belly, hand, especially hand, all charred by the de Havilland fire. Lungs scalded by smoke.”

Ernest had ordered a bottle of Valpolicella Superiore, which he told the waiter to pour without waiting for the bottle to breathe. “Italian reds don’t need oxygen,” he said. “I got that bit of Bacchanalian wisdom from Fitzgerald.”

I said, “You got a lot from Fitzgerald, didn’t you?”

“Got and gave,” Ernest said. “Met him first in Paris at the Dingo Bar. The

Fitzgeralds sometimes invited us to dinner, and on one occasion two sisters, Pauline and Ginny Pfeiffer.”

“So that’s how you met Pauline? What was your take on her?”

“First impression? Small, flat-chested, not nearly as attractive as her sister. Pauline had recently come to Paris to work at *Vogue* magazine, and she looked like she’d just stepped out of its pages. Up-to-date fashion. Close-cropped hair like a boy’s, à la mode back then, short; fringed dress, loops of pearls,

**Hemingway (entering New York Harbor with his second wife, Pauline Pfeiffer, aboard the ocean liner *Paris* on April 3, 1934) later described Pauline as “clever and entertaining and full of desire.”**

costume jewelry, rouged, bright red lips.

“I never gave Pauline another thought after that dinner. Hadley was the only woman who mattered in my life, her full body and full breasts, hair long to her shoulders, long-sleeved dresses at her ankles, little or no jewelry or makeup. I adored her looks and

the feel of her in bed, and that's how it was. She lived her life loving the things I loved: skiing in Austria, picnics on the infield at the Auteuil races, staying up all night at the bicycle races at the Vélodrome, fortified with sandwiches and a thermos of coffee, trips to alpine villages to watch the Tour de France, fishing in the Irati, the bullfights in Madrid and Pamplona, hiking in the Black Forest.

"Occasionally, Pauline and Ginny would come by my workplace at the end of a day, that little bare room I had rented on the fifth floor, sans heat, sans lift, sans most everything, in the old shabby hotel on rue Mouffetard. They'd corral me for drinks at a nearby café, bringing good humor and wit and liveliness to what had been a frustrating, unproductive day. After a time, Ginny didn't come anymore and Pauline came alone, looking up-to-the-minute chic, cheerful and exuding admiration, which, of course, after a tough day felt good.

"She had the 'I get what I want' hubris of a very rich girl who won't be denied. The Pfeiffer clan owned the town of Pig-gott, Arkansas. Pauline's old man owned a chain of drugstores and God knows what else—maybe all of Arkansas.

"Back then, to be honest, I probably liked it—poverty's a disease that's cured by the medicine of money. I guess I liked the way she spent it—designer clothes, taxis, restaurants. Later on, when reality got to me, I saw the rich for what they were: a goddamn blight like the fungus that kills tomatoes. I set the record straight in *Snows of Kilimanjaro*, but Harry, who's laid up with a gangrenous leg, is too far gone by then and he dies without forgiving the rich. I think I still feel the way Harry felt about the rich in the story. Always will."

Ernest asked if I had been to the *fe-ria* in Pamplona, the annual bullfight festival that honored their patron saint. I said I hadn't. "I started to write soon after we left Pamplona, and for the next five weeks it overwhelmed me. That fever was an out-of-control brush fire that swept me into Pauline's

**Hemingway told his first wife, Hadley (the couple with their toddler son, Jack, in Austria in 1926), that "I prayed that God would take care of her to make up for the hurt I had inflicted."**

maw. She'd have me for a drink in her attractive apartment on rue Picot, and that started it.

"I first called the book *Fiesta*, later on *Sun Also Rises*. Over those five weeks, I wrote it in various places, promising myself that when I returned to Paris, I'd avoid Pauline, but the fever of writing and rewriting opened me up to her."

He refilled his wineglass. I passed.

"You ever loved two women at the same time?"

I said I hadn't.

"Lucky boy," he said.

"Fitzgerald could see it coming right from the start," Ernest went on. "He said, 'You are being set up by a *femme fatale*. When she first arrived in Paris, word was out that she was shopping for a husband. She wants you for herself, and she'll do anything to get you.' I leveled with him and confessed I loved both of them.

"All I see after a really tough day writing, there're two women waiting for me, giving me their attention, caring about me, women both appealing, but in different ways. Told Scott I liked having them around. Stimulating, fires me up.

"Scott said I was a sad son of a bitch who didn't know a damn thing about women. He gripped my arm and pulled me toward him. Raised his voice. 'Get rid of her! Now! Right here! It's a three-alarm fire! Now's the time! Tell her!'

"I truly loved Hadley and I wanted to get us straight again. So I decided to get us out of Paris and the temptation of Pauline. Hadley and I packed up that winter and went to Austria, to Schruns, with Bumby [their toddler son, Jack] to ski. We stayed at the Hotel Taube, a couple of dollars a day for all three of us. I was going to cut Pauline off. But, shitmaru, she followed us to Schruns, booked herself into the Taube, said she wanted to learn to ski, would I give her lessons. Hadley wasn't happy about it, but she was a good sport. Actually, Pauline wasn't nearly







as good as Hadley skiing or horseback riding, shooting, fishing, name it.

“When Pauline had to go back to Paris, I was relieved that maybe alone with Hadley, I could shape up and lose the pressure of loving both of them.

“But a cable arrived from Max Perkins, editor at Scribner, with the terrific news they were going to publish *Sun Also Rises*. Would I go to New York for contracts and all that. I took off for Paris immediately and booked myself on the first decent boat, four days later. Hadley and Bumby stayed in Schruns and I said I’d return as soon as I got back from New York.

games, singing and drinking with the locals at the bar.

“But, Christ, soon as we returned to Paris in the spring, I fell back with Pauline. It went like that all that spring.

“I worked hard and finished revising the book, working on the galleys. It was now ready for publication.

“Hadley did hold on for a while, but we had withdrawn from each other. I was asking too much of her. We decided to split up.

“I went to Gerald Murphy’s sixth-floor studio at 69, rue Froidevaux, which he [an American friend] had offered to me. Also, knowing I was broke,

---

When I **DID ARRIVE**, Hadley was standing there, **LOVELY HADLEY**, and **LITTLE BUMBY**, husky and snow-tanned. At **THAT MOMENT** I **WISHED I HAD DIED** before loving anyone else.

“Pauline showed up the minute I set foot in Paris. I spent those four nights in her bed until my boat left for New York.

“When I went back to Paris with my book contract in my pocket I should have gone directly to Schruns, where Hadley and Bumby had been waiting the 19 days I had been gone. But Pauline met my boat train when I arrived in Paris. I passed up three trains to stay with her at her place.

“When I did arrive at the Schruns station, Hadley was standing there, lovely Hadley, and little Bumby, husky and snow-tanned. At that moment I wished I had died before loving anyone else.

“Hadley and I had a happy time that winter in Schruns, skiing and poker

he slipped 400 bucks into my checking account at the Morgan Guaranty, which I used to repay some debts.”

**The next time** we actually got together was in the summer of 1955. On the morning of July 4, I flew to Miami, caught a small afternoon plane to Key West and took a taxi to 414 Olivia Street. The main house was a stone Spanish Colonial with a veranda. Ernest had not lived there since 1940, when, after a long separation, he was divorced from Pauline; it had become her property as part of the divorce settlement and she had lived there until her recent death, when the property had passed to the children. But the

children did not want to live there. So it fell to Ernest to come over from Cuba, where he lived in the Finca Vigía in San Francisco de Paula to arrange for a broker to rent it or maybe sell it.

Ernest, wearing swim trunks, came from the main house to greet me.

At dusk, we sat on the terrace as the first pale fireworks invaded the sky. "This is where I wrote 'The Snows of Kilimanjaro,' and that's as good as I have any right to be, but now that I'm here, it's not an escape, it just reminds me of a disturbing part of my life. I should have known better than to even hope for redemption."

I asked him what had occurred after he and Hadley went their separate ways. Did he continue seeing Pauline? He said of course, she made sure of that, but he'd kept up his obligation to spend time with Bumby.

"On one of those times I came to get him, Hadley intercepted me and said it was time we talked.

"She picked up a pen and a sheet of paper. 'So there's no misunderstanding,' she said. Then she wrote, 'If Pauline Pfeiffer and Ernest Hemingway do not see each other for one hundred days, and if at the end of that time Ernest Hemingway tells me that he still loves Pauline Pfeiffer, I will, without further complication, divorce Ernest Hemingway.' She signed her name and offered the pen to me. I said it read like a goddamn death warrant. 'It is,' she said. 'Either she dies or I do.' Never in my life signed anything with more reluctance. Took the pen and signed.

"'Hadley,' I said, 'I love you, I truly do—but this is a peculiar passion I have for her that I can't explain.'

"That night I had dinner with Pauline and told her about the hundred days. She smiled and said that was perfectly okay with her. She took a rose from the vase on the table and handed it to me and told me to be sure to press it under our mattress.

"Pauline exiled herself to her hometown of Piggott, Arkansas, population 2,000.

"Before leaving, she left me a message that we were destined to face life to-

**In waters off Cuba from the 1940s on, Hemingway pursued sport fishing, casting for marlin aboard the *Pilar*, "a 38-foot boat that was outfitted," he recalled, "especially for me."**

gether, and that's that. She said she had the wherewithal for us to live very well.

"I had settled into Murphy's studio," he said. "The outside view was of the Cimetière du Montparnasse. With the prospect of one hundred days of misery ahead of me, I was ready for one of the tombstones: Here lies Ernest Hemingway, who zigged when he should have zagged."

**On the evening of the third day of my Key West visit, Ernest decided he and I should get food and drink at his favorite haunt, Sloppy Joe's, Key West's most celebrated saloon. I thought this was a good time to get Ernest back to talking about the hundred days.**

"Was *The Sun Also Rises* published by then?"

"Just elbowing its way into the bookstores.

"It's true that drinking ratcheted up my anguish. That and daily letters from Pauline, lamenting the pitfalls of boring Piggott, plus her wild yearning for me."

"What about Fitzgerald during this period?" I asked.

"When I described my hundred-day predicament, he was very much on Hadley's side.

"Scott asked me if they were really different, distinct from each other. I said yes, they were, that Hadley was simple, old-fashioned, receptive, plain, virtuous; Pauline up-to-the-second chic, stylish, aggressive, cunning, nontraditional.

"Scott asked if they differed as sex partners. 'Night and day,' I told him. 'Hadley submissive, willing, a follower. Pauline explosive, wildly demonstrative, in charge, mounts me. They're opposites. Me in charge of Hadley and Pauline in charge of me.'

"'Ernest, listen,' he said, 'the important thing is that you should be in charge of you. You need the shining qualities of Hadley. Her buoyancy. Neither Pauline or her money can provide that.'"

The following day was very hot,



buzzing squadrons of insects hovering over the garden. We sat on the edge of the shady side of the pool, our legs in the water.

"Those black days," he said, shaking his head. "I marked them off my calendar the way a convict marks his. The nights were particularly bad, but some places helped take my mind off them. One of them was Le Jockey, a classy





nightclub in Montparnasse—wonderful jazz, great black musicians who were shut out in the States but welcomed in Paris. One of those nights, I couldn't take my eyes off a beautiful woman on the dance floor—tall, coffee skin, ebony eyes, long, seductive legs. Very hot night, but she was wearing a black fur coat. The woman and I introduced ourselves.

"Her name was Josephine Baker, an

American, to my surprise. Said she was about to open at the Folies Bergère, that she'd just come from rehearsal.

"I asked why the fur on a warm night in June. She slid open her coat for a moment to show she was naked. 'I just threw something on,' she said; 'we don't wear much at the Folies. Why don't you come? I'm headlining as the ebony goddess.' She asked if I was mar-

ried. I said I was suspended, that there were two women, one my wife, and neither wanted to compromise.

"‘We should talk,’ she said. She'd once had a situation like that.

"I spent that night with Josephine, sitting at her kitchen table, drinking champagne sent by an admirer. I carried on nonstop about my trouble, analyzing, explaining, condemning, justifying, mostly bullshit. Josephine listened, intense, sympathetic; she was a hell of a listener. She said she, too, had suffered from double love.

"The rest of that night, into dawn, we talked about our souls, how I could convince my soul that despite my rejection of one of these women and inflicting hurt on her, it shouldn't reject me."

"So, Papa," I asked, "what happened when the hundred days ended?"

"It didn't."

"Didn't what?"

"The end started on the seventy-first day that I marked off my calendar. I was having a drink at the Dingo Bar. I was using the Dingo as my mail drop, and on this night the bartender handed me my accumulated mail. My breath caught in my throat. Why would Hadley write to me? I dreaded opening it. 'Dear Ernest,' Hadley's handwriting, only a few lines. It said although thirty days short of the time she had set, she had decided to grant me the divorce I obviously wanted. She was not going to wait any longer for my decision, which she felt was obvious.

"I needed to walk. There was a late-rising moon.

"I was relieved when the dawn finally broke. I went back up the old worn stone steps, heading for Murphy's studio. I sat down at the desk, began to write a letter to Hadley. I told her I was informing Scribner that all of my royalties from *The Sun Also Rises* should go to her. I admitted that if I hadn't married her I would never have written this book, helped as I was by her loyal and loving backing and her actual cash support. I told her that Bumby was certainly lucky to have her as his mother. That she was the best and honest and loveliest person I had ever known. I had achieved the moment I had tena-

ciously sought, but I wasn't elated, nor did I send a cable to Pauline. What I felt was the sorrow of loss. I had contrived this moment, but I felt like the victim.

"I wrote to Pauline, telling her the swell news that Hadley had capitulated and that she could now come back to Paris."

I asked him what happened when Pauline returned to Paris.

"We had never discussed marriage, and certainly I wasn't of a mind to rush into it without a decent transition, if at all. But not Pauline. She immediately booked a church for the wedding, fashionable Saint-Honoré-d'Eylau in the Place Victor-Hugo.

sculptured close to her head. For my part, I wore a tweed suit with a vest and a new necktie."

**The following day** in Key West, Ernest didn't appear until late afternoon.

"You ever read that old bugger Nietzsche?" he asked.

"A little," I said.

"You know what he said about love? Said it's a state where we see things widely different from what they are."

"Pauline?"

"Yup. It didn't take long to unsee those things. I guess it started when we went to live with her folks in Piggott."

"A lot of books were being written

be single when, as it seemed more and more likely, I would leave Pauline and return to her and Bumby.

"As depressing as existence was in Piggott, it got even worse when Pauline announced she was pregnant. Just as marriage had reared up too soon, so was I not ready for the upset of having a baby around. Pauline had a horrendous battle in the delivery room for 18 grueling hours that surrendered to a cesarean operation.

"I got in touch with an old friend, Bill Horne, met up with him in Kansas City, and drove to a dude ranch in Wyoming, where, praise the Lord, I had a really good three weeks away from Pauline, the squalation, and the Piggott clan. I worked mornings on my new book, *A Farewell to Arms*.

"I'll tell you when I threw in the towel on Pauline," Ernest said, "When she announced she was going to have another baby. The first one had made me bughouse and a second one, howling and spewing, would finish me off. And it nearly did.

"The baby was another boy—this one we named Gregory—even more of a howler and squawler than Patrick, so, as before, I got out of Piggott fast. I went for a two-week spell in Cuba. The two weeks stretched to two months.

"I spent most of my evenings with a 22-year-old beauty named Jane Mason, who came from uppity Tuxedo Park, New York, just about the least inhibited person I'd ever known."

"Did Pauline know about her?" I asked.

"Made sure she did."

"You were giving her plenty of ammunition for a divorce?"

"It was time. But Pauline was not going to give in no matter what."

"As a lure to keep me in Key West, Pauline convinced her uncle Gus to pony up for the *Pilar*, the boat we fish on when you're in Cuba. Why don't we go out tomorrow? Gregory will put out a couple of lines. I don't think the marlin are running right now, but there's plenty else."

Gregorio Fuentes was skilled in handling the

CONTINUED ON PAGE 78



## SHE STEPPED BACK AND LOOKED AT ME.

'My goodness, Ernest,' she  
said, 'you look the same.'

'NOT YOU.' 'Oh?'

'YOU LOOK EVEN LOVELIER.'

"I made my regular visits to Hadley's apartment to pick up Bumby. Hadley usually absented herself, but one time she was still there when I arrived. Rather to my surprise, not having planned it, there suddenly blurted out of me that if she wanted me, I would like to go back to her. She smiled and said things were probably better as they were. Afterward, I spent some time at the Dingo Bar berating myself.

"For the wedding, Pauline wore a dress designed for her by Lanvin, a strand of Cartier pearls, and a hairdo

about the First World War we had fought against the Germans in France and Germany, but I had a monopoly on Italy and the part of the war I was in there. I wrote early every morning in Piggott before the suffocating heat took over. The days and nights were as bleak as a stretch of Sahara Desert.

"The gloom intensified when I received a letter from Fitzgerald telling me that Hadley had remarried with Paul Mowrer, a journalist I knew. Gentle, thoughtful man, he was Paris correspondent for the *Chicago Daily News*. What threw me was how quickly Hadley had married.

"My fantasy was that she would still





*"My fellow Americans, ask not what your country can do for you,  
ask what you can do for your country."*

Inaugural Address  
Friday, January 20, 1961

*- John F. Kennedy*

The just-released John F. Kennedy presidential dollar figured to be among the most popular issues in the ongoing series of \$1 coins honoring the nation's chief executives, now in the ninth year of its roughly 10-year run. JFK was one of America's most beloved presidents, and his shocking assassination ensured that his images would endure, as if frozen in time, in our nation's history.

**Historic Coin Portrait** The new coin design is the work of Don Everhart, a senior sculptor-engraver on the U.S. Mint's roster of staff artists. Depicting a contemplative JFK looking down and seemingly lost in thought, the image is similar to the official portrait hanging in the White House – also capturing Kennedy in a reflective moment, with his head bowed and eyes downcast. The portrait was painted in 1970, seven years after the assassination, and was closely monitored by Kennedy's widow, Jacqueline, who not only commissioned the artist, Aaron Shikler, but also gave him detailed instructions on how she wanted the president to be shown. The portrait differs greatly from the presidential images on other White House paintings, and Everhart has acknowledged that Shikler's work inspired the equally unique likeness of JFK on the coin.

**A Woman's Touch** It's a little-known fact, but Jacqueline Kennedy, one of America's favorite First Ladies, also played a role in the final design of the enormously popular Kennedy half dollar, which was first issued in 1964. She asked the coin's designer, Mint Chief Engraver Gilroy Roberts, to modify the details of her husband's hair – and the changes were, of course, made.

**JFK, Purple Heart & Navy SEALs** John F. Kennedy was a different kind of president – the youngest ever elected, recipient of a Purple Heart for his heroism, creator of the Navy SEALs, and the first (and so far only) Roman Catholic, to cite four important examples. In my opinion, such a president deserves a coin that likewise bears a historic design. I believe Don Everhart captured what Jackie and JFK would have liked, given the design of the presidential painting. I base this on a story my parents told me many years ago regarding an interaction they had with Jack and Jackie Kennedy at a 1959 dinner in Lake Charles, Louisiana. (See Bonus Gifts)

*"This new JFK dollar continues the tradition of historic, artistic coins like those I saw in the Smithsonian's exclusive opening of the new Value of Money exhibit."*

- Mike Fuljenz

President - Universal Coin & Bullion®

America's Gold Expert®

**Award-Winning Industry Leader**

3 - Investment Book of the Year Awards\*

7 - Best Dealer Publication Awards\*

2015 - Book of the Year Award\*



Follow Mike Fuljenz

\*Numismatic Literary Guild Award Winner



**FREE**  
Priority Shipping  
\$6 Value

**\$1 FOR \$1**

BRILLIANT UNCIRCULATED

**John F. Kennedy Golden Dollar**

✓ Newly Released ✓ Not Available in Banks

• Just as they left the Mint • From original Mint rolls

**\$1 ea. / Phone Orders Only**

**Minimum Purchase 5 Coins / Limit 10 per household**

**1.800.822.4653**



check/money order

Vault Verification: USMTHGK1015 • Offer Expires: 10/08/15

Availability not guaranteed • Price subject to change • No dealers please

Please read important customer disclosures on our website or that accompany products purchased, including arbitration agreement. Images are not to scale.

**BONUS GIFTS TWO PER ORDER \$6 VALUE**

Historical John F. Kennedy photo & handwritten

letter (copy) to Mike Fuljenz's mother.

Ask about the correction done by the First Lady when you call.

High-resolution digital copy, frame not included. Limit 2 per household



**MIKE FULJENZ**

Type Three Double Eagles 1877-1907 (Second Edition)

*Autographed Copy*

**\$39.95 Ships Free**  
with Kennedy coin purchase

237 pages with over 100 gorgeous full-color coin photographs



*Literary Experts Say*

**"The work having the greatest potential impact on numismatics!"**

**2015 NLG Book of the Year Award-Winner**

Universal Coin & Bullion® is proud to announce that our President and America's Gold Expert®, Mike Fuljenz, was honored at the 2015 World's Fair of Money, receiving awards and recognition, including the prestigious "Book of the Year" award from the Numismatic Literary Guild for his newly released Type Three Double Eagles 1877-1907 (Second Edition).

**Congratulations Mike - 56 Awards spanning 13 categories in 29 years!**

**Official Rare Coin & Bullion Dealer of the Southland Conference**



Est. 1994

Beaumont, TX



SHOP ONLINE: ✓ Award-Winning Videos & Resources ✓ Shopping & Special Offers ✓ Buying, Selling, Security Tips & More



## STERLING MONOGRAM NECKLACE

Custom-crafted in our studios of sterling silver. The stylized initials form a unique centerpiece measuring 1 3/4" wide. Featured necklace is 16" long. Other lengths also available.

Item #444001 **\$95** FREE SHIPPING

To receive this special offer, you must use Offer Code: **JUSTME26**



Please allow 2-3 weeks for delivery; personalized items may not be returned.

# ROSS + SIMONS

ORDER NOW 1.800.556.7376 [www.ross-simons.com/JUSTME](http://www.ross-simons.com/JUSTME)



**archaeological  
tours**

Led by noted scholars  
Superb itineraries  
Unsurpassed service

New 2016 Catalog Out Now



We have something for everyone in our latest catalog... each of our tours features our signature mix of culture and history - from China to Peru and everywhere in between. Request your copy today!

[info@archaeologicaltr.com](mailto:info@archaeologicaltr.com)  
[www.archaeologicaltr.com](http://www.archaeologicaltr.com)  
Call 212-986-3054,  
Toll-free 866-740-5130

## Visit Alaska in 2016!



### Grand Alaskan Cruise & Tour

**12 days from \$1,799\***

Make 2016 the year you go North to Alaska. Visit both Denali National Park and Glacier Bay National Park on the same trip! We are the largest independent tour operator in Alaska for a reason: we know this state like it was our home. **Departs May - September**

\*Prices are per person, double occupancy. Plus \$299 taxes & government fees. Based on inside cabin category. Cabin upgrades are available, as is add-on airfare. Single supplement applies. Ask your Travel Consultant for details.



**1-877-525-7942**

[ymtvacations.com](http://ymtvacations.com)  
Mention promo code EM122506

## Hemingway

CONTINUED FROM PAGE 76

boat when Ernest had a marlin strike. I had no doubt Gregorio was the inspiration for the old man in *The Old Man and the Sea*.

"I made a mistake with Pauline, that's all. A goddamn fatal mistake. She tried to use her wealth to connect us, but it just put me off."

"You must have been relieved," I said, "finally getting your divorce from Pauline."

"Pretty much, but it had its sad downside. After my shaky beginning with the boys—I told you about taking off when they were babies; I'm just no good at those first couple of diaper and colic years—but afterward I tried to make up for it."

"You're right," I said, "that's sad about the boys."

"Something even sadder happened." He slowly shook his head, remembering an interlude in Paris.

"I was at Lipp's [Brasserie] on their enclosed terrace having a drink—there was a taxi stand there and a cab pulled up to discharge a passenger and damn if it wasn't Hadley. Hadn't laid eyes on her since our divorce. She was very well dressed and as beautiful as I remembered her. As I approached her, she saw me, gasped, and threw her arms around me. Having her up against me shortened my breath. She stepped back and looked at me."

"My goodness, Ernest," she said. "You look the same."

"Not you."

"Oh?"

"You look even lovelier."

"I follow you in the newspapers. *A Farewell to Arms* was wonderful. You're a romantic, you know."

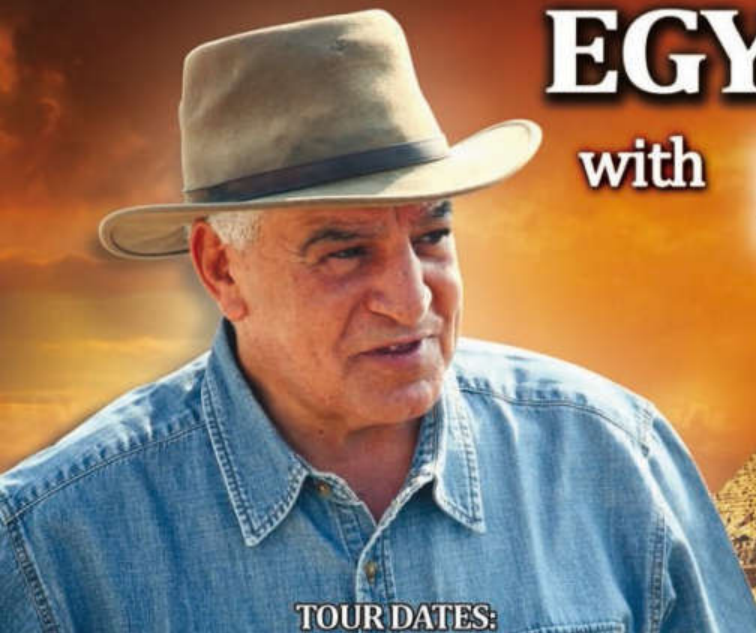
"You still married to what's his name?"

"Yes, I'm still Mrs. What's His Name."

I invited her into Lipp for champagne. We discussed people we knew and what had become of them. I said, "You know, Hadley, I think about you often."

"Even now?"





# EGYPT TOURS

with

## DR. ZAHI HAWASS

the most famous archaeologist in the world!



### TOUR DATES:

**February 15-28**

**March 13-26**

**April 17-30**

**May 15-28**

**September 17-30**

**October 15-28**

We are presenting to you the most exciting tours to Egypt that have ever been offered! There is no better person to lead you through the fascinating history of ancient Egypt than Dr. Zahi Hawass, the most famous archaeologist in the world and the former Minister of Antiquities in Egypt!

**For more information visit:**

**[www.archaeologicalpaths.com](http://www.archaeologicalpaths.com)**



[contact@archaeologicalpaths.com](mailto:contact@archaeologicalpaths.com)

☎ US phone: (917) 719 1974

## Robert Sexton Tonight And Forever

### *A Most Unusual Gift of Love*

This drawing is called "Tonight And Forever." It is completely composed of dots of ink. After writing the poem, I worked with a quill pen and placed thousands of these dots, one at a time, to create this gift in honor of the love shared by two of my dearest friends.

Now, I have decided to offer "Tonight And Forever" to those who have known and valued its sentiment. Each litho is numbered and signed by hand and precisely captures the detail of the drawing.

Measuring 14" by 16", it is available either fully-framed in a subtle copper tone with hand-cut mats of pewter gray and rust at \$135, or in the mats alone at \$95. Please add \$14.50 for insured shipping and packaging. Either way, your satisfaction is guaranteed.

My best wishes are with you.

**[www.robertsexton.com](http://www.robertsexton.com)**

P.O. Box 581, Rutherford, CA 94573

All major credit cards are welcomed. Checks are welcomed.

Contact us at 415-989-1630 between 10-6 PM PST.

Order online through our website. Please allow 2 to 3 weeks for delivery.

*I will ask no more of life  
than this:  
that I might love you  
through all my days,  
and that you may find  
both peace and joy  
in the constancy  
of my heart.*



*Tonight And Forever*

**THE POEM READS:** *I will ask no more of life than this: that I might love you through my days, and that you may find both peace and joy in the constancy of my heart.*



## PLAN YOUR **LEGACY**

**ANDREW BEYER AND SUSAN VALLON** share a passion for contemporary art. They recently made a bequest to the Smithsonian's Hirshhorn Museum and Sculpture Garden to purchase art and create cultural programs.

*"We love the Hirshhorn. It's filled with surprises. We are glad that we can give something to future generations."*



Smithsonian

*Your Plan. Your Legacy. Your Smithsonian.*

**Begin planning your legacy.** Please fill out, detach and return to the address below.

- ☐ Send information on including the Smithsonian in my will or other estate plans.
- ☐ I have already included the Smithsonian in my will or other estate plans.
- ☐ Send information about gifts to the Smithsonian that provide income for life.

NAME BIRTHDATE

ADDRESS

CITY/STATE/ZIP

TELEPHONE EMAIL PG1510SM

### OFFICE OF PLANNED GIVING

PO Box 37012 | MRC 035 | Washington, DC 20013 | 888.419.7584 | [legacy@si.edu](mailto:legacy@si.edu)

"You know what I'm remembering—that evening when *The Sun Also Rises* was published, and I put on my one necktie and we went to the Ritz and drank champagne with fraises des bois in the bottom of the glass. There's something romantic about poverty when you're young and hopeful."

"I asked if she could have dinner with me. She looked at me, remembering me. She gave it some thought.

"I said, 'I have no sinister motive—just to look at you across a table for a little while.'"

"You know, Ernest," she said, "if things hadn't been so good between us, I might not have left you so quickly."

"How many times I thought I saw you passing by. Once in a taxi stopped at a light. Another time in the Louvre I followed a woman that had the color of your hair and the way you walk and the set of your shoulders. You would think that with the passage of time, not being with you or hearing from you, you would fade away, but no, you are as much with me now as you were then."

"And I'll always love you, Tatle. As I loved you in Oak Park and as I loved you here in Paris." She raised her glass and touched it with mine. She drank the last of her champagne and put down her glass. "I must go to my appointment," she said.

"I accompanied her to the corner and waited with her for the light to change. I said I remembered those dreams we dreamed with nothing on our table and the wine bottle empty. 'But you believed in me against those tough odds. I want you to know, Hadley, you'll be the true part of any woman I write about. I'll spend the rest of my life looking for you.'

"Good-bye, my Tatle."

"The light changed to green. Hadley turned and kissed me, a meaningful kiss; then she crossed the street and I watched her go, that familiar, graceful walk."

Ernest leaned his head back and closed his eyes, perhaps seeing Hadley, turning her head to take a last look at him before disappearing into the crowded sidewalk.

"That was the last time I saw her." ○



the best pure cotton non-iron dress shirt

UNBEATABLE  
INTRODUCTORY  
OFFER **\$19.95**

reg \$89.50

you save  
**75%**

- white 100% cotton
- wrinkle-free & easy care
- 4 collar styles
- button or french cuffs
- regular, big & tall or trim  
14½" x 32" to 20" x 37"

- **FREE**  
monogramming  
reg \$10.95

- add this pure silk  
tie for just **\$19.95**  
reg \$69.50

blue, red, green, black,  
purple, orange

**Paul Fredrick**

[paulfredrick.com/best](http://paulfredrick.com/best)

800-309-6000

specify promo code **WWFSSM**

FREE EXCHANGES. new customer offer only.  
limit 4 shirts. shipping extra. not combinable. expires 10/31/15.



# U.S. GOVERNMENT GOLD AT-COST

TODAY - U.S. Money Reserve has scheduled what could be its final release of U.S. government-issued \$5 gold coins previously held at the U.S. Mint at West Point. These government-issued gold coins are being released on a first-come, first-served basis for the incredible markup-free price of only \$120 per coin. Please be advised: U.S. Money Reserve's at-cost U.S. government gold coin inventory will be available at this special price while supplies last or for up to 30 days. Do not delay. Call today.

## OWN GOV'T-ISSUED GOLD COINS

*DUE TO STRICT LIMITED AVAILABILITY, TELEPHONE ORDERS WILL BE ACCEPTED ON A FIRST-COME, FIRST-SERVED BASIS ACCORDING TO THE TIME AND DATE OF THE ORDER.*

**PURE COST - NO DEALER MARKUP!**

**\$120<sup>00</sup>**  
EACH

PRICES MAY BE MORE OR LESS BASED ON  
CURRENT MARKET CONDITIONS. CALL NOW.

If you've been waiting to move your hard-earned money into precious metals, now is the time to consider transferring your U.S. dollars into United States government gold coins. Gold's recent 10-year performance to date has surpassed the Nasdaq, Dow and S&P 500. Call immediately to order your United States gold coins direct from U.S. Money Reserve's Main Vault Facility, for the amazing at-cost price of only \$120 per coin. Special arrangements can be made for gold purchases over \$50,000. Order your gold today!

- 1 – U.S. Gov't-Issued Gold Coin      \$120**  
(PLUS INSURANCE, SHIPPING & HANDLING \$15.00)
- 5 – U.S. Gov't-Issued Gold Coins      \$600**  
(PLUS INSURANCE, SHIPPING & HANDLING \$25.00)
- 10 – U.S. Gov't-Issued Gold Coins      \$1,200**  
(PLUS INSURANCE, SHIPPING & HANDLING \$35.00)

**CALL TOLL-FREE (7 Days A Week)**

**1-855-429-9485**

MASTERCARD • VISA • AMEX • DISCOVER • CHECK • BANK WIRE

  
**U.S. MONEY**  
RESERVE

**Vault No. SMT40-120**

1/10-ounce coins  
enlarged to show detail.

© 2015 U.S. Money Reserve. The markets for coins are unregulated. Prices can rise or fall and carry some risks. The company is not affiliated with the U.S. Government and the U.S. Mint. Past performance of the coin or the market cannot predict future performance. Special offer is strictly limited to only one lifetime purchase of 10 coins (regardless of price paid) per household, plus shipping and insurance (\$15-\$35). Price not valid for precious metals dealers. All calls recorded for quality assurance. Offer void where prohibited. Coin dates our choice.



## Chicago Doctor Invents

# Affordable Hearing Aid

**New nearly invisible digital hearing aid breaks price barrier in affordability**

Reported by J. Page

Chicago: Board-certified Ear, Nose, and Throat physician Dr. S. Cherukuri has done it once again with his newest invention of a medical-grade, AFFORDABLE hearing aid.

This new digital hearing aid is packed with all the features of \$3,000 competitors at a mere fraction of the cost. **Now, most people with hearing loss are able to enjoy crystal clear, natural sound—in a crowd, on the phone, in the wind—without suffering through “whistling” and annoying background noise.**

### Digital Hearing Aid Outperforms Expensive Competitors

This sleek, fully programmed, light-weight, hearing aid is the outgrowth of the digital revolution that is changing our world. While demand for “all things digital” caused most prices to plunge (consider DVD players and computers, which originally sold for thousands of dollars and today can be purchased for less), the cost of a digital medical-grade hearing aid remains out of reach.

Dr. Cherukuri knew that many of his patients would benefit but couldn't afford the expense of these new digital hearing aids. Generally they are *not* covered by Medicare and most private health insurance plans.



**Nearly Invisible!**

### SAME FEATURES AS EXPENSIVE HEARING AID COMPETITORS

- ✓ Mini Behind-the-Ear hearing aid with thin tubing for a nearly invisible profile
- ✓ Advanced Noise Reduction to make speech clearer
- ✓ Feedback Cancellation eliminates whistling
- ✓ Wide Dynamic Range Compression makes soft sounds audible and loud sounds comfortable
- ✓ Telecoil setting for use with compatible phones, and looped environments like churches
- ✓ 3 Programs and Volume Dial accommodate most common types of hearing loss even in challenging listening environments

MDHearingAid®  AIR

The doctor evaluated the high priced digital hearing aids on the market, broke them down to their base components, and then created his own affordable version — called the MDHearingAid *AIR* for its virtually invisible, lightweight appearance.

### Affordable Digital Technology

Using advanced digital technology, the MDHearingAid *AIR* automatically adjusts to your listening environment — prioritizing speech and de-emphasizing background noise. Experience all of the sounds you've been missing at a price you can afford. This doctor designed and approved hearing aid comes with a full year's supply of long-life batteries. It delivers crisp, clear sound all day long and the soft flexible ear domes are so comfortable you won't realize you're wearing them.

### Try it Yourself at Home with our 45-Day Risk-Free Trial

Of course, hearing is believing and we invite you to try it for yourself with our RISK-FREE 45-Day home trial. If you are not completely satisfied, simply return it within that time period for a full refund of your purchase price.

### Can a hearing aid delay or prevent dementia?

A study by Johns Hopkins and the National Institute on Aging suggests older individuals with hearing loss are significantly more likely to develop dementia over time than those who retain their hearing. They suggest that an intervention—such as a hearing aid—could delay or prevent dementia by improving hearing!

### “Satisfied Buyers Agree AIR is the Best Digital Value!”

*“I am hearing things I didn't know I was missing. Really amazing. I'm wearing them all the time.”* —Linda L., Indiana

*“Almost work too well. I am a teacher and hearing much better now.”* —Lillian B., California

*“I have used many expensive hearing aids, some over \$5,000. The AIRs have greatly improved my enjoyment of life.”* —Som Y., Michigan

*“I would definitely recommend them to my patients with hearing loss.”* —Amy S., Audiologist, Indiana



**For the Lowest Price plus FREE Shipping Call Today**

**800-873-0541**

**Phone Lines Open  
24 Hours EVERY DAY**

**Use Offer Code CF54 to get  
FREE Batteries for a Full Year!**

**www.MDHearingAid.com**

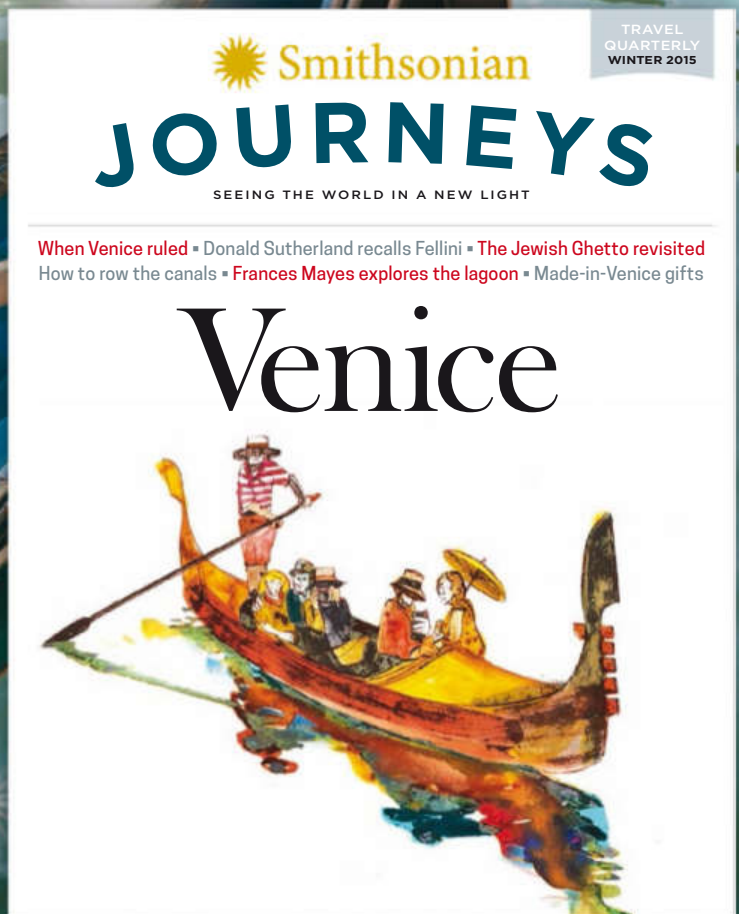


# See the World in a New Light

TRAVEL TO **VENICE**  
IN THE NEXT ISSUE OF  
**SMITHSONIAN JOURNEYS**  
QUARTERLY MAGAZINE

AVAILABLE ON  
NEWSSTANDS

**OCTOBER 13, 2015**





Introducing Kyrobak®, the only home-use device using professional Oscillation Therapy and Continuous Passive Motion (CPM) technology, recommended by doctors worldwide, that's clinically proven\* to bring you...

# LASTING RELIEF from BACK PAIN

Introducing Kyrobak, the new device that uses professional technology for personal use to deliver lasting results — and it takes just 10 relaxing minutes!

Kyrobak is clinically proven\* to treat lower back pain and provide lasting relief. For many users, it offers a drug-free alternative to the constant requirement for powerful painkillers.

And, in a recent clinical study, Kyrobak was shown to continue to provide pain relief even 3 weeks after usage was stopped!

Now, for the first time ever, Oscillation Therapy and Continuous Passive Motion technology, as

**NO ASSEMBLY NEEDED**

used by medical professionals, are available in this doctor-recommended, home-use device. Just 10 relaxing minutes is all it takes for Kyrobak to deliver lasting relief for your lower back pain.

"Ten minutes and then I'm free to do the things I love without pain, without worrying if something is going to stop me from enjoying life."

Ken S., Museum Curator

## DISCOVER THE KYROBAK ADVANTAGE

With Kyrobak, you will get much more than momentary relief. The longer



## DOCTOR RECOMMENDED

"What makes Kyrobak so effective is the unique CPM technology it provides to muscles and joints. This specific type of motion reduces inflammation and sends important signals to the nervous system to restore muscle tone, balance and blood supply."

DR. STEVEN GEANOPULOS,  
CHIROPRACTIC NEUROLOGIST



Kyrobak users continued treatment, the more relief they reported.

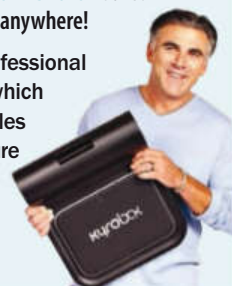
Kyrobak is convenient and easy to use! It's lightweight and portable, too! Move Kyrobak from room to room with ease ... in fact, you can take it with you wherever you go!

**Call now for more details on your 60-Day Risk-Free Trial and put an end to the agony of back pain for good!**

**GET RELIEF NOW  
RISK FREE  
FOR 60 DAYS**

- **CLINICALLY PROVEN\*** treatment for lower back pain relief in the comfort of your home
- **LASTING RELIEF** experienced, even up to 3 weeks after usage has stopped
- **FAST & CONVENIENT** just 10 minutes
- **SAVES MONEY** no more expensive trips to the doctor
- **UNIQUE TECHNOLOGY** benefit from proven Oscillation Therapy + Continuous Passive Motion technology
- **EASY TO USE** on the floor, bed or couch
- **NATURAL TREATMENT** with no painkillers or prescription drugs needed
- **COMPACT, LIGHTWEIGHT DESIGN** so it's easy to use and store anywhere!

Kyrobak uses a professional technology, CPM, which loosens tight muscles and releases pressure between the vertebrae in your spine to relieve back pain.



**— 100% —  
RISK FREE  
60-DAY TRIAL**

If you don't LOVE your Kyrobak, simply return it within 60 days and we will refund all your money PLUS pay the return postage. Call for details!

**Kyrobak works on the floor, the sofa ... even on your bed!**

You do not have to be physically fit to use Kyrobak. You can enjoy your treatment while in complete rest, on the floor, your bed or even on the couch.



## 3 SIMPLE STEPS TO LASTING RELIEF

### STEP 1

**PLUG IN!**



**ABSOLUTELY NO ASSEMBLY REQUIRED BEFORE USE**

### STEP 2

**LIE DOWN!**



**SO EASY TO USE! SIMPLY CLOSE YOUR EYES AND RELAX**

### STEP 3

**TURN ON!**



**AUTO SWITCH-OFF AFTER EACH 10-MINUTE TREATMENT**

**kyrobak** *Try it now!* **RISK-FREE FOR 60 DAYS**  
*You have nothing to lose but the agony of lower back pain!*

**CALL NOW 1-800-971-1407**

or discover more at [www.KyroOffer271.com](http://www.KyroOffer271.com)



## Cut the cost of your medical alert service in half.

Why pay more every month on service fees when you can feel protected everywhere you go with the most affordable medical alert service on the market? The GreatCall® Splash has no installation costs and no special equipment to buy. And there are no cancellation fees or contracts to sign. Just the highest level of service at the lowest price.

At only \$19<sup>99</sup> a month, 5Star® Service on the Splash can save you up to 50% in monthly service fees. That's a total savings of \$200 per year compared to other medical alert services.

With no landline required, you're not restricted to your home. The Splash works anywhere you choose to go. And with its waterproof design, you can even take it with you in the shower. In any emergency, just press the button to speak immediately with a 5Star Medical Alert Agent, 24/7. The Agent will confirm your location using patented GPS technology, evaluate your situation and get you the help you need.

Service as low as

**\$19<sup>99</sup>**  
month

No contracts  
No cancellation fees  
No equipment to install

**First month FREE with purchase from:**



sears

Walmart  
Pharmacy

Fastest Agent  
response time\*

Available with  
Fall Detection

Patented GPS  
confirms your location

Nationwide  
coverage

Waterproof design  
works in the shower

# Call 1-888-858-1316 today or visit us at [greatcall.com](http://greatcall.com)



\*Good Housekeeping Research Institute - Aug. 2014. \$200 savings calculation was determined by averaging PERS market leaders' monthly fees (not all PERS have the same features). Requires a one-time setup fee of \$35 and valid credit or debit card for monthly service. The Splash is rated IPX7, and can be submerged in up to 3ft of water for up to 30 mins. Fall Detection is an optional feature. We cannot guarantee Fall Detection will always accurately detect a fall. GreatCall is not a healthcare provider. Seek the advice of your physician if you have questions about medical treatment.

5Star or 9-1-1 calls can only be made when cellular service is available. 5Star Service will be able to track an approximate location when your device is turned on, but we cannot guarantee an exact location. Monthly service fee does not include government taxes or assessment surcharges, and is subject to change. GreatCall and 5Star are registered trademarks of GreatCall, Inc. Copyright ©2015 GreatCall, Inc.

You're out for a walk  
and suddenly feel dizzy.

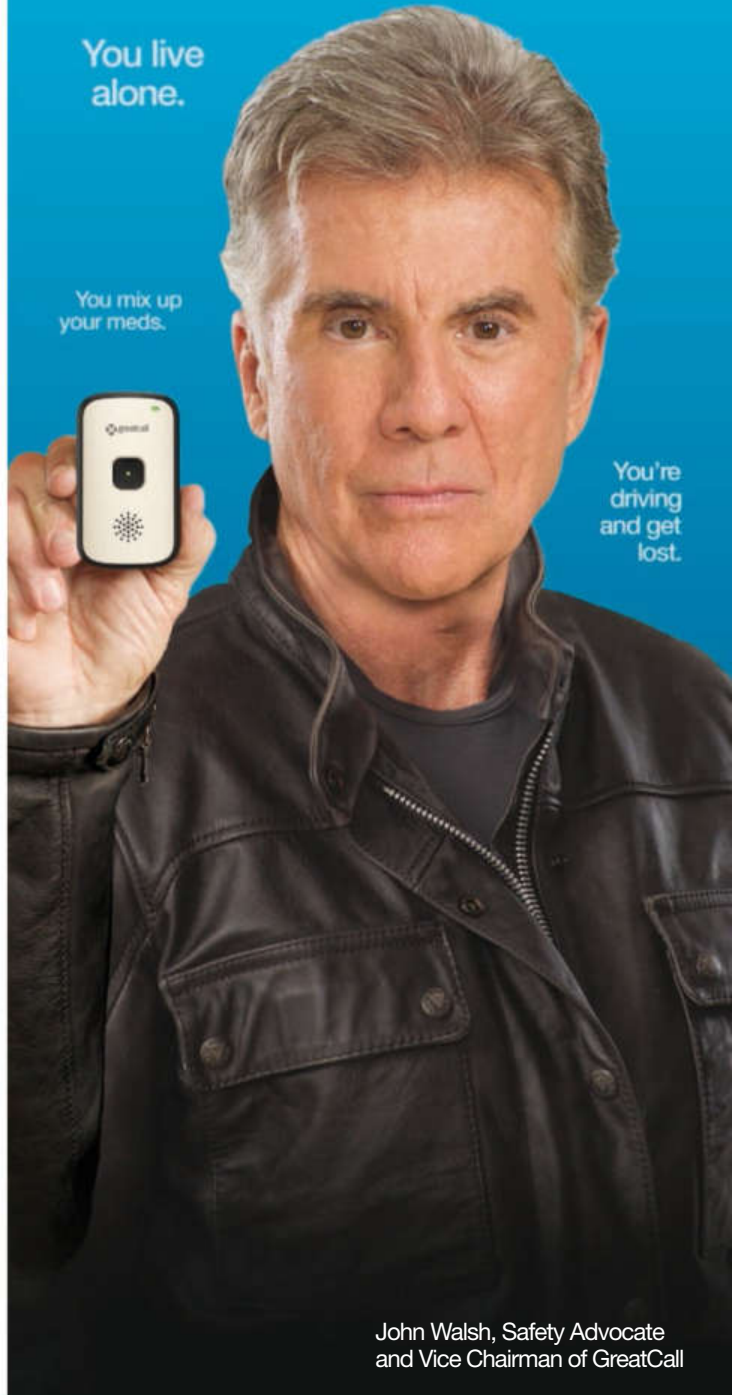
You stumble  
in the garden.

You slip  
in the  
shower.

You live  
alone.

You mix up  
your meds.

You're  
driving  
and get  
lost.



John Walsh, Safety Advocate  
and Vice Chairman of GreatCall



# Get your free guide to tax-free municipal bonds.

Please call (800) 901-0736 right now.

## Municipal Bonds Offer Three Big Advantages.

### Advantage #1: The potential safety of principal.

If you're a prudent investor in need of investment income, you don't want to gamble with your precious nest egg. If you're nearing retirement or are already retired, you want to do everything you can to make sure your investments can support your retirement. That's why our free Bond Guide makes "must" reading.

### Advantage #2: The potential for regular, predictable income.

When you invest in municipal bonds, you typically get interest payments every six months unless they get called or default. Because default rates for the investment-grade-rated bonds favored by Hennion & Walsh are historically low (according to Moody's 2012 research,\*) you can enjoy a regular income stream in retirement. Please note that if a bond is called, any bond you may buy in the future with the proceeds, may earn more or less than the original called bond.

### Advantage #3: The potential for tax-free income.

Good news! Income from municipal bonds is NOT subject to federal income tax and, depending on where you live, may also be exempt from state and local taxes.

### About Hennion & Walsh

Since 1990, Hennion & Walsh has specialized in investment grade tax-free municipal bonds. The company supervises over \$2 billion in assets in over 15,000 accounts and provides individual investors with institutional quality service and personal attention.



Dear Investor,

We urge you to call and get your free Bond Guide. Having tax-free municipal bonds as part of your portfolio can help get your investments back on track and put you on a path to achieving your investment goals. Getting your no-obligation guide could be the smartest investment decision you'll make.

© 2014 Hennion and Walsh. Securities offered through Hennion & Walsh Inc. Member of FINRA, SIPC. Investing in bonds involves risk including possible loss of principal. Income may be subject to state, local or federal alternative minimum tax. When interest rates rise, bond prices fall, and when interest rates fall, bond prices rise. \*Source: Moody's Investor Service, March 7, 2012 "U.S. Municipal Bond Defaults and Recoveries. 1970-2011." Past performance is not guarantee of future results.



Here's just some of  
what you'll learn . . .

Why municipal bonds may  
deserve a place in your  
portfolio. (Page 1)

Why insured bonds often  
provide an extra degree of  
security. (Page 2)

Why municipal bonds can  
potentially provide safety of  
principal. (Page 3)

How municipal bonds can  
potentially provide tax-free  
income. (Page 3)

Strategies for smart bond  
investing. (Page 4)

Municipal bond facts every  
investor should know. (Page 4)

Plus lots more!

**FREE  
Bond Guide**

Without Cost or Obligation

**CALL**

**(800) 901-0736**

(for fastest service, call  
between 8 a.m. and 6 p.m.)

Hennion & Walsh, Bond Guide Offer  
2001 Route 46, Waterview Plaza  
Parsippany, NJ 07054

**DALLAS PRIDGEN JEWELRY**

- ONE AT A TIME.... BY HAND -

Actual  
Size

Donkey Brooch  
Sterling Silver \$58  
14k Gold \$449    1-800-477-1856  
[www.dallaspridgenjewelry.com](http://www.dallaspridgenjewelry.com)  
Unconditionally Guaranteed • Call for FREE Catalog

**rentanappletree.com***A Unique Gift Idea*

Fresh New York Apples  
From Your Tree to Your  
Door!

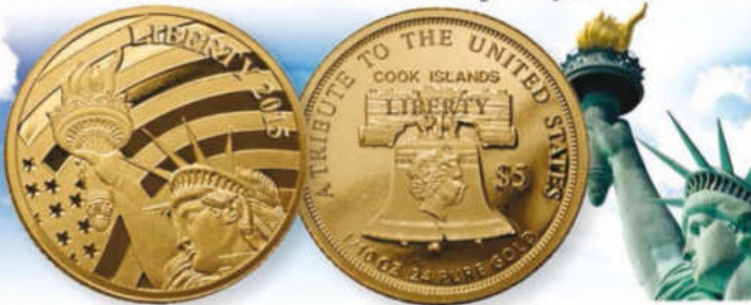
Perfect For Any  
Occasion!

**607-425-9907****info@rentanappletree.com****ISLAND WINDJAMMERS  
CARIBBEAN CRUISES****All inclusive | 12 to 30 Guests****877.772.4549****islandwindjammers.com**

National Collector's Mint announces  
the 125th Anniversary minting of the...

# Statue of Liberty \$5 Coin

*struck in solid .24 Pure Gold for just \$99!*



History is being made! It's the 125th anniversary of one of America's most beloved icons – the Statue of Liberty. Now, the Lady in the Harbor is being honored with a new, non-circulating Cook Islands legal tender, .24 Pure Gold five dollar coin.

This magnificent striking features Lady Liberty, torch held high, on the obverse, with the American flag waving behind her. On the reverse, the famous Liberty Bell stands as tribute to the United States of America, with the official Cook Islands imprimatur, and \$5 denomination. Of course, each one tenth ounce, 16 mm diameter coin is permanently engraved with its weight and its .24 Pure Gold content.

The final issue price was to be set at \$129 per coin. However, during this advance release, this solid, .24 Pure Gold masterpiece can be yours for only \$99. Because of volatility in the gold market, this price can be guaranteed for one week only.

National Collector's Mint, Inc. is an independent, private corporation not affiliated with, endorsed, or licensed by the U.S. Government or the U.S. Mint. © 2015 NCM, Inc. Purchase, NY

**Limited Offer**

Each Cook Islands 2015 *Statue of Liberty 125th Anniversary \$5 Coin* comes with a Certificate of Authenticity. Due to record-breaking demand for gold, there is a strict limit of five .24 Pure Gold coins per order. Reservations will be filled on a first-come, first-served basis. As always, if you're not 100% delighted with your purchase simply send us your postage paid return within 60 days for a refund of your purchase price.

**How To Order**

To assure your reservation, we ask you to call us immediately Toll-Free 1-800-799-MINT, Ext. 2896 (1-800-799-6468).

You may reserve one *Statue of Liberty 125th Anniversary \$5 Coin* for \$99 plus \$5.95 shipping, handling and insurance, 3 for only \$299 ppd., or 5 for just \$495 ppd. Deluxe presentation cases are only \$6.00 each ppd. So avoid disappointment and future regret. Reserve yours today!

**REPLACEMENTS, LTD.**  
*China, Crystal & Silver • Old & New***800-REPLACE****replacements.com****WORLD'S FINEST  
Eye Cream!**

A "Selections" product  
in Oprah Magazine!

Refreshing,  
anti-aging Airbrush  
Eye Refining  
Treatment hydrates,  
soothes, reduces crows  
feet and puffiness, and promotes collagen  
for younger, brighter looking eyes.

20% off with code **SMIT7** at  
**www.dremu.com** or **800.542.0026**

**OPEN 7 DAYS****AWAKE**  
-The Life of Yogananda-**A Stunning  
Companion Book**

Based on the award-winning  
documentary film

**FEATURES:**

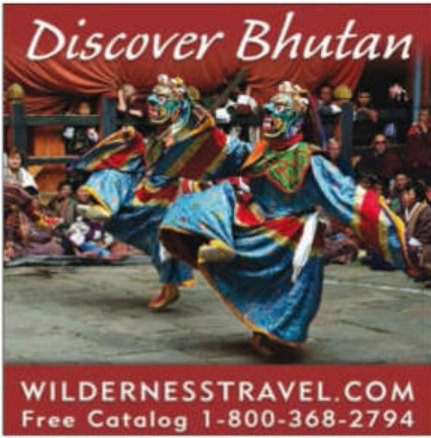
- 400+ photos
- Interviews
- much more

**www.SRFBKBOOKS.ORG/AWAKE**

**CALL TOLL-FREE 1-800-799-MINT** ASK FOR EXT. 2896  
(1-800-799-6468)

8J-873





**Discover Bhutan**

WILDERNESSTRAVEL.COM  
Free Catalog 1-800-368-2794



Iranian girls welcoming our November 2007 group to Isfahan

**VISIT IRAN**

Small Group Cultural Tours

SERIOUS TRAVELER  1-800-762-4216  
www.SeriousTraveler.com

BULGARIA ETHIOPIA INDIA



**AMERICAN CLASSIC**

FREE Shipping: N5566

**Be Glad You Waited  
Now Only \$59**

*The Legendary 1904-O Morgan Silver Dollar, Brilliant Uncirculated*

In 1962, the 1904-O New Orleans Mint Morgan silver dollar was one of the three most expensive in the series. Mint-state issues listed for \$350 and only a few thousand were known to exist in any condition. Then hundreds of bags of pristine 1904-O Morgans emerged during the last Treasury releases. Today no other BU in the entire series costs so little compared to its peak price. **\$59 (#44963).** *New customers only. Limit 2 per household. NO CLUBS TO JOIN; NO ON-APPROVAL COINS SENT. 30-Day No-Risk Home Examination: Money-Back Guarantee.*

International Coins & Currency  
62 Ridge Street, Dept. N5566, Montpelier, VT 05602  
**1-800-451-4463**  
[www.iccoin.com/n5566](http://www.iccoin.com/n5566)



## Discover Hidden Treasures of the Caribbean on a Small Ship Cruise

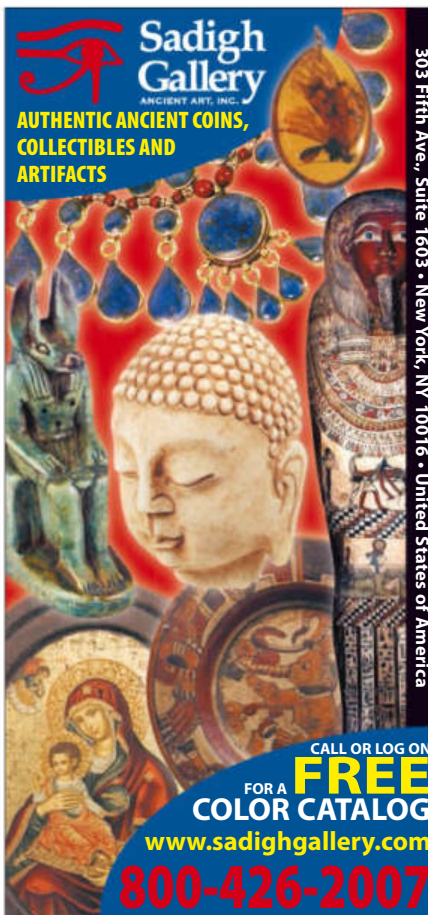
The Bahamian Out Islands - 12 Days

The Bahamas & Caicos Islands - 16 Days

Call **888-392-1029** or  
visit [blountsmallshipadventures.com](http://blountsmallshipadventures.com)  
for a FREE brochure.

**BLOUNT**  
SMALL SHIP ADVENTURES

*Go where the big ships cannot.*



**Sadigh Gallery**  
ANCIENT ART, INC.

**AUTHENTIC ANCIENT COINS,  
COLLECTIBLES AND  
ARTIFACTS**

303 Fifth Ave., Suite 1603 • New York, NY 10016 • United States of America

CALL OR LOG ON  
FOR A **FREE**  
COLOR CATALOG  
[www.sadighgallery.com](http://www.sadighgallery.com)  
**800-426-2007**



Come explore Costa Rica with Caravan.

## Costa Rica

Natural Paradise **9 Days \$1095**  
**Volcanoes, Rainforests and Beaches.**  
**All Meals Included!**—Join the smart shoppers and experienced travelers who rely on Caravan for a wonderful vacation.

**Day 1.** Your vacation begins in San José.

**Day 2.** Visit Poás Volcano. Tour a coffee plantation and stop at a butterfly garden.

**Day 3.** See traditional artisans in Sarchi. Continue to Fortuna for a two night stay.

**Day 4.** Cruise on the Rio Frio. Enjoy a relaxing soak in volcanic hot springs.

**Day 5.** Hike the Hanging Bridges. Enjoy views of majestic Arenal Volcano. Visit Leatherback Turtle National Park. Then, to your beach resort for a two night stay.

**Day 6.** At leisure to enjoy resort and spa.

**Day 7.** Cruise on the Tarcoles River. Continue to your hotel, located directly at the entrance to Manuel Antonio Park.

**Day 8.** Visit the world famous Manuel Antonio National Park. Hike through rainforests and along spectacular beach coves. Enjoy an aerial tram adventure.

**Day 9.** Return with wonderful memories!

*Read full tour itinerary at Caravan.com*

### #1 Value—Guided Tours Since 1952.

Guatemala, Tikal, Antigua 10 days \$1295

**Costa Rica 9 days \$1095**

Panama Tour, Canal Cruise 8 days \$1195

Nova Scotia, P.E.I. 10 days \$1395

Canadian Rockies, Glacier 9 days \$1595

Grand Canyon, Bryce, Zion 8 days \$1395

California Coast, Yosemite 8 days \$1295

Mt. Rushmore, Yellowstone 8 days \$1295

New England, Fall Foliage 8 days \$1295

Tax and fees extra.

*"Brilliant, Affordable Pricing"*  
—Arthur Frommer, Travel Editor

**Free 28-pg Brochure**

[caravan.com](http://caravan.com) 1-800-caravan

**caravan**





**1oz .999 Silver Bars**  
**\$1.75 over spot**  
 spot + \$1.75 = cost of bar  
 \$14.90 + \$1.75 = \$16.65  
*Limit 50*

**1 oz. Fine Silver**  
**\$18.50**  
**2015 Silver American Eagle**  
*Limit 2*

**Dates of our choice**  
 Pre 1900 \$20 Gold Liberty  
**\$1285**  
*Limit 1*

**Portfolio Program available, positions starting at \$10,000**

**1-866-789-2646**  
**www.ImperialCurrency.com**

\$2.00 PRIORITY SHIPPING  
 Prices and availability subject to change.  
 We reserve the right to withdraw this offer at anytime.  
 New Customers Only  
 Spot basis: GOLD \$115.00 per oz. - SILVER \$14.90 per oz.

VAULT CODE SM1015

## Better Way To Sleep

### PURE COTTON KNIT TeePJs™



Tee-PJs are not ordinary nightshirts. They are made with a special soft cotton knit that moves as you move for the ultimate in sleeping and lounging comfort.

- ★NO BIND ★NO BUNCH
- ★NO BUTTONS
- ★NO SIDE SEAMS

**QUALITY MADE IN THE USA!**

**TeePJs – the most comfortable sleeper you've ever worn or your money back!**

**Great for Ladies, too.**

**COLORS:** White or Soft Blue.  
**SIZES:** To fit 90-300 lbs.  
 Specify man/lady and **height/weight** for a perfect fit.  
**Add \$2 per nightshirt for XXXL.**

**\$26.95 ea. 2 for \$49.90 (Save \$4)**  
 Long sleeve style (not shown):  
**\$30.95 ea. 2 for \$57.90 (Save \$4)**  
**S&H: add \$6.95 for 1 or \$8.95 for 2**  
 Send check or use Visa/MC/Discover/AMEX

**Cotton Comforts Since 1955**  
**ittmann Textiles - Dept. 414**  
**11570 SE Dixie Hwy, Hobe Sound, FL 33455**  
**(Ship to FL add tax) 1-800-890-7232**  
**HUGE SELECTION OF COTTON SLEEPWEAR, ROBES AND UNDERWEAR - www.nightshirt.com**

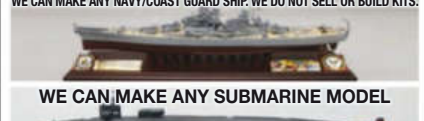
**www.motionmodels.com**  
 THE WORLDS FINEST READY-MADE AND CUSTOM TRUE MUSEUM QUALITY AIRPLANE AND NAVY AND COAST GUARD SHIP MODELS.



**USS G.H.W. BUSH CVN-77 CUSTOM MADE FOR PRESIDENT BUSH AND NORTHROP GRUMMAN**



**WE CAN MAKE ANY NAVY/COAST GUARD SHIP. WE DO NOT SELL OR BUILD KITS.**



**WE CAN MAKE ANY SUBMARINE MODEL**



**www.motionmodels.com**  
**1-800-866-3172**

## ZIPWALL®

### DUST BARRIER SYSTEM



## Remodel without dust.

**zipwall.com**

## WhiteWalls®

### Magnetic Whiteboard Steel Walls Panels



**WhiteWalls.com**  
**800 624 4154**

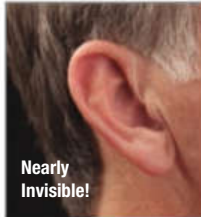



WhiteWalls give you and your team an unlimited blank slate that encourages original ideas and fosters out of the box solutions.



## TINY NEW AFFORDABLE HEARING AID

The MDHearingAid® **AIR** is doctor designed and delivers the same hearing experience as devices costing thousands of dollars for 90% less. This FDA-Registered, state-of-the-art digital hearing aid provides crystal clear, natural sound — in a crowd, on the phone, in the wind — without “whistling” or annoying background noise. **Call today for a 45-Day, Risk-Free trial with a 100% money-back guarantee and get FREE batteries for a full year.**



Nearly Invisible!

**Call 800.873.0541**  
with Offer Code CF71 or visit  
**MDHearingAid.com**

## LOWEST PRICE EVER on DR® Leaf Vacuums!



- ✓ **Rated #1 in Vacuum Power**
- ✓ **Easy, 1-Hand Dumping**
- ✓ **Stores Flat in Minutes**
- ✓ **Converts to a Utility Trailer**

The NEW DR® Leaf Vacuum is designed from the top down to make yard clean up easier, faster, and more thorough than ever before. And for a limited time we are offering them at incredible low introductory prices!

**NEW Models**

Starting at **\$1,299<sup>99</sup>**

89203X © 2015

**FREE SHIPPING 1 YEAR TRIAL**

SOME LIMITATIONS APPLY

**Call for FREE DVD and Catalog!**

TOLL-FREE

**888-212-8850**

DRleafvac.com



## ATHENA PHEROMONES™ INCREASE AFFECTION



Created by Winnifred Cutler, Ph.D. in biology from U. of Penn, post-doc Stanford in behavioral endocrinology. Co-discovered human pheromones in 1986 (Time 12/1/86; and Newsweek 1/12/87) Author of 8 books on wellness.

## PROVEN EFFECTIVE IN 3 DOUBLE BLIND STUDIES



Unscented Fragrance Additives

Vial of 1/6 oz. added to 2-4 oz. of your fragrance, worn daily lasts 4-6 months, or use it straight.

Athena 10X™ For Men \$99.50  
10:13™ For Women \$98.50  
Cosmetics **Free U.S. Shipping**

♥ **Alice (MA)** 13 orders “I researched it, bought it and it works! I swear 10:13 makes people treat you better. It really is wonderful the way your pheromone has changed my life.” Rec’d 6/3/15

♥ **Mario (FL)** 3rd order. “I am a physician. Women react; they stop and stare; they swivel their heads toward me. 10X is kind of a minor weapon! You have quite a product!”

Not in stores **610-827-2200**

**www.Athenainstitute.com**

Athena Institute, 1211 Braefield Rd., Chester Springs, PA 19425 SMS

## COLLECTOR'S SET 8 for \$8 at Face Value!

Get a **Complete 8-Coin Set of 2015 Presidential Dollars at face value of \$8!** You'll receive Uncirculated Philadelphia “P” and Denver “D” issues of all four 2015 designs — honoring Presidents Harry S. Truman, Dwight D. Eisenhower, John F. Kennedy and Lyndon B. Johnson! These 2015 coins are struck for 3 months each and will never be minted again. Get the 8-coin year set at **FACE VALUE – limit one set!**

**SAVE 65% plus receive a FREE GIFT**

Order your Complete Uncirculated 8-coin set today at face value of **ONLY \$8** and **SAVE 65% off the regular price of \$22.95**. Plus, respond by deadline and get a **FREE** Uncirculated 2015 Bombay Hook quarter, honoring a national wildlife refuge in Delaware. With tidal salt marshes, freshwater pools and timbered swamps, this is a natural sanctuary for migrating waterfowl.

You'll also receive our fully illustrated catalog, plus other fascinating selections from our Free Examination Coins-on-Approval Service, from which you may purchase any or none of the coins — return balance in 15 days — with option to cancel at any time. **Order your complete 8-coin set and SAVE!**

**Mail coupon today or order online at: [www.LittletonCoin.com/specials](http://www.LittletonCoin.com/specials)**

45-Day Money Back Guarantee of Satisfaction

**FREE**

Get a **FREE** Uncirculated 2015 Bombay Hook Quarter when you order by deadline.



★ **John F. Kennedy**

Kennedy vowed to put a man on the moon by the end of the decade and led the nation through the Cuban Missile Crisis.

### Special Offer for New Customers Only

**YES!** Please send me a Complete Uncirculated 8-Coin Set of 2015 P&D Presidential Dollars at **FACE VALUE OF ONLY \$8.00 – regularly \$22.95**, plus **Free Shipping** (limit 1 set). Also send my **FREE** Uncirculated 2015 Bombay Hook National Park Quarter (one per customer, please).

**SAVE!** Add Custom 2007-Date Presidential Dollar Display Folders for \$2.95 – regularly \$3.49 – and **SAVE! USA**

Name \_\_\_\_\_ Please print your complete name and address clearly

Address \_\_\_\_\_ Apt# \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

E-Mail \_\_\_\_\_

| QTY | DESCRIPTION                                    | PRICE  | TOTAL  |
|-----|------------------------------------------------|--------|--------|
| 1   | 8-Coin Collector's Set (limit 1 set)           | \$8.00 | \$8.00 |
|     | Display Folders – <b>SAVE 15%</b>              | \$2.95 |        |
|     | <b>FREE Shipping!</b> Merchandise <b>TOTAL</b> | \$     |        |

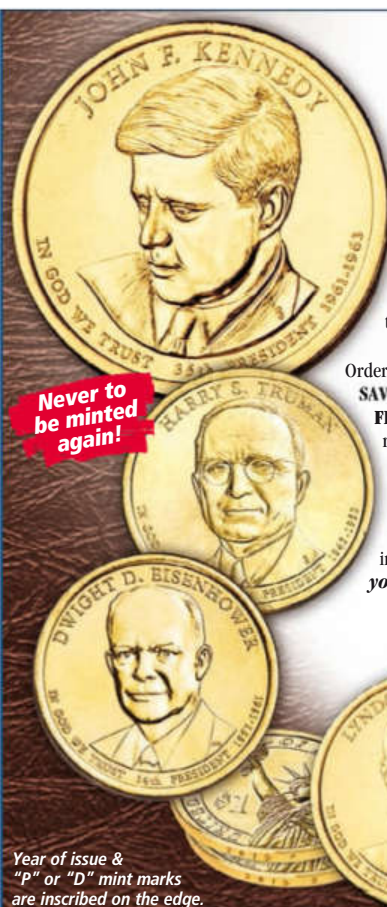
**Order Deadline: 12:00 Midnight, October 31, 2015**

☐ Check or Money Order payable to Littleton Coin Company

**Charge my:** ☐ VISA ☐ MasterCard ☐ American Express ☐ Discover Network

Card No. \_\_\_\_\_ Exp. Date \_\_\_\_\_ / \_\_\_\_\_

Please send coupon to:  
**Littleton Coin Co., Dept. 3XZ404**  
1309 Mt. Eustis Rd, Littleton NH 03561-3737  
America's Favorite Coin Source • TRUSTED SINCE 1945



**Never to be minted again!**

Year of issue & “P” or “D” mint marks are inscribed on the edge.

©2015 LCC, LLC

CONTINUED FROM PAGE 24 Sun en route to Earth. Einstein used the new equations to make this precise—he calculated the mathematical shape of these curved trajectories. But to test the prediction astronomers would need to see distant stars while the Sun is in the foreground, and that's only possible when the Moon blocks out the Sun's light, during a solar eclipse.

The next solar eclipse, of May 29, 1919, would thus be general relativity's proving ground. Teams of British astronomers, led by Sir Arthur Eddington, set up shop in two locations that would experience a total eclipse of the Sun—in Sobral, Brazil, and on Príncipe, off the west coast of Africa. Battling the challenges of weather, each team took a series of photographic plates of distant stars momentarily visible

sorry for the Dear Lord because the theory is correct."

Indeed, in the decades since the eclipse measurements, there have been a great many other observations and experiments—some ongoing—that have led to rock-solid confidence in general relativity. One of the most impressive is an observational test that spanned nearly 50 years, among NASA's longest-running projects. General relativity claims that as a body like the Earth spins on its axis, it should drag space around in a swirl somewhat like a spinning pebble in a bucket of molasses. In the early 1960s, Stanford physicists set out a scheme to test the prediction: Launch four ultra-precise gyroscopes into near-Earth orbit and look for tiny shifts in the orientation of the gyroscopes' axes that, according to the theory, should be caused by the swirling space.

It took a generation of scientific effort to develop the necessary gyroscopic technology and then years of data analysis to, among other things,

like a ball of dough being alternately stretched and compressed.

In the early 1990s, a team led by scientists at MIT and Caltech initiated a research program to detect gravitational waves. The challenge, and it's a big one, is that if a tumultuous astrophysical encounter occurs far away, then by the time the resulting spatial undulations wash by Earth they will have spread so widely that they will be fantastically diluted, perhaps stretching and compressing space by only a fraction of an atomic nucleus.

Nevertheless, researchers have developed a technology that just might be able to see the tiny telltale signs of a ripple in the fabric of space as it rolls by Earth. In 2001, two four-kilometer-long L-shaped devices, collectively known as LIGO (Laser Interferometer Gravitational-Wave Observatory), were deployed in Livingston, Louisiana, and Hanford, Washington. The strategy is that a passing gravitational wave would alternately stretch and compress the two arms of each L, leaving an imprint on laser light racing up and down each arm.

In 2010, LIGO was decommissioned, before any gravitational wave signatures had been detected—the apparatus almost certainly lacked the sensitivity necessary to record the tiny twitches caused by a gravitational wave reaching Earth. But now an advanced version of LIGO, an upgrade expected to be ten times as sensitive, is being implemented, and researchers anticipate that within a few years the detection of ripples in space caused by distant cosmic disturbances will be commonplace.

Success would be exciting not because anyone really doubts general relativity, but because confirmed links between the theory and observation can yield powerful new applications. The eclipse measurements of 1919, for example, which established

## The next phase of astronomy may center on gathering gravitational waves produced by distant cosmic upheavals, allowing us to probe the universe in a wholly new way.

as the Moon drifted across the Sun.

During the subsequent months of careful analysis of the images, Einstein waited patiently for the results. Finally, on September 22, 1919, Einstein received a telegram announcing that the eclipse observations had confirmed his prediction.

Newspapers across the globe picked up the story, with breathless headlines proclaiming Einstein's triumph and catapulting him virtually overnight into a worldwide sensation. In the midst of all the excitement, a young student, Ilse Rosenthal-Schneider, asked Einstein what he would have thought if the observations did not agree with general relativity's prediction. Einstein famously answered with charming bravado, "I would have been

overcome an unfortunate wobble the gyroscopes acquired in space. But in 2011, the team behind Gravity Probe B, as the project is known, announced that the half-century-long experiment had reached a successful conclusion: The gyroscopes' axes were turning by the amount Einstein's math predicted.

There is one remaining experiment, currently more than 20 years in the making, that many consider the final test of the general theory of relativity. According to the theory, two colliding objects, be they stars or black holes, will create waves in the fabric of space, much as two colliding boats on an otherwise calm lake will create waves of water. And as such gravitational waves ripple outward, space will expand and contract in their wake, somewhat





# Affordable Hearing Aid Technology Only \$299!

New innovative **digital hearing aid** makes great hearing affordable!

New breakthroughs in **digital hearing technology** allow you to experience remarkable improvement in your hearing without having to spend thousands of dollars. In fact, the new affordable **HCX Digital Hearing Aid** is **only \$299!**

The HCX has all the important features you need, without the unnecessary bells and whistles that just add to the cost.

**SAVE \$50** ON A PAIR  
And Get **FREE** 1 Year Supply Of Batteries\*

## The All New HCX Hearing Aid!

- ▶ Digital sound processing chip provides crystal clear sound and makes speech easier to understand without feedback
- ▶ Multiple memory programs adapt to most listening situations
- ▶ Nearly invisible thin tube design
- ▶ Helpful **low battery warning** so you are never caught unprepared
- ▶ Easy to find, long lasting size **13 batteries**
- ▶ 10 bands of layered noise reduction helps to **emphasize voices while balancing out background noise**

## We Have Been Making Our Customers Happy For 19 Years!

*"I will definitely recommend your company to my patients." - Dr. Arun P.*

*"I just want to let you know how happy my husband and myself are with his new hearing aids! We had no idea it would be such a fast, simple and enjoyable process..." - Monique S.*

## Studies Show: Hearing Aids MAY HELP PREVENT DEMENTIA.

A study by Dr. Frank Lin at the John Hopkins University, found that patients with even a mild hearing loss were two times more likely to develop dementia. Fortunately, hearing aids help address hearing loss and may help prevent cognitive health due to hearing loss.

[www.AdvancedHearing.com/Dementia](http://www.AdvancedHearing.com/Dementia)

## Affordable Performance

The Advanced Affordable Hearing HCX digital hearing aid is simply the best value in the hearing aid market today. For **only \$299 for one hearing aid**, you can experience the same digital technology used in far more expensive hearing aids. With the HCX, hearing really is believing! We believe so strongly that you will love what you hear that we offer a **100% Money Back Guarantee** if you are not satisfied for any reason. This **Risk Free Offer** allows us to prove to you the quality and craftsmanship of our products. For a limited time, your price is as low as **\$274 per hearing aid when you buy a pair.**

## Discreet With Unmatched Comfort

The HCX is a small and discreet hearing aid that comes with a soft medical grade rubber tip. You will love how light the open-fit design feels! The HCX is comfortable enough to wear all day.



The HCX™

## 100% Money Back Guarantee

Expert hearing researchers and technicians have spent years perfecting our products. We offer you the best possible value in hearing today. We have set a high standard to make sure YOU are happy with your new hearing aid. **If you are not satisfied for any reason, we offer a 100% Money Back Guarantee!**

**BUY A PAIR AND SAVE \$50!**

**1-888-259-5971**

Free 1 Year Supply Of Batteries! ▼

\*Use Coupon Code When You Order: **SM50**



The HCX



US Company  
Owned And  
Operated

**FDA**  
REGISTERED

[www.AdvancedHearing.com/SM50](http://www.AdvancedHearing.com/SM50)



## Aspens

From our Pacific Northwest Collection, Aspens in Sterling Silver, shown full size. The earrings are single sided, the pendant design shows an aspen grove on the back.



#3506 Aspen Grove Moon Pendant with  
20" sterling silver box chain .....\$100

#3506E Aspen Leaf Earrings, leverback .....\$52



Made in Australia

The Snowy River defines Australian outback style and quality. Roan leather sweatband, 4" crown, 3 1/4" brim.

Choose size: 6 3/4 - 8 1/2

Colors: Fawn (shown), Gray or Black

#1611 Snowy River .....\$155

add \$9 handling per order.

**Shop davidmorgan.com**  
or request our catalog



Akubra® Hats from Australia  
Pacific NW Jewelry  
and much more...

**David Morgan**

800-324-4934 davidmorgan.com

11812 N Creek Pkwy N, Ste 103•Bothell, WA 98011



SMITHSONIAN; October 2015; Volume 46, Number 6, *Smithsonian* (ISSN 0037-7333) is published monthly (except for July/August issue) by Smithsonian Enterprises, 600 Maryland Ave. S.W., Suite 6001, Washington, D.C. 20024. Periodical postage paid at Washington, D.C. and additional mailing offices. POSTMASTER: send address changes to Smithsonian Customer Service, P.O. Box 62170, Tampa, FL 33662-2170. Printed in the USA. Canadian Publication Agreement No. 40043911. Canadian return address: Brokers Worldwide, PO Box 1051, Fort Erie, ON L2A 6C7.

We may occasionally publish extra issues. ©Smithsonian Institution 2015. All rights reserved. Reproduction in whole or in part without permission is prohibited. Editorial offices are at MRC 513, P.O. Box 37012, Washington, D.C. 20013 (202-633-6090). Advertising and circulation offices are at 420 Lexington Ave., New York, NY 10170 (212-916-1300). MEMBERSHIP DUES/SUBSCRIPTION Prices: All subscribers to *Smithsonian* are members of the Smithsonian Institution. United States and possessions: \$26 a year payable in U.S. funds. Canada add \$13 (U.S. funds) for each year. Foreign add \$26 (U.S. funds) for each year. Ninety-nine percent of dues is designated for magazine subscriptions. Current issue price is \$6.99 (U.S. funds). Back issue price is \$7.00 (U.S. funds). To purchase a back issue, please call or email James Babcock at 212-916-1323 or babcock@gsi.edu.

Mailing Lists: From time to time we make our subscriber list available to companies that sell goods and services we believe would interest our readers. If you would rather not receive this information, please send your current mailing label, or an exact copy, to: Smithsonian Customer Service, P.O. Box 62170, Tampa, FL 33662-2170.

Subscription Service: should you wish to change your address, or order new subscriptions, you can do so by writing Smithsonian Customer Service, P.O. Box 62170, Tampa, FL 33662-2170, or by calling 1-800-766-2149 (outside of U.S., call 1-813-910-3609).

Notice of change to membership discounts: Smithsonian National Associate members will now receive exclusive member discounts from The Great Courses at [www.thegreatcourses.com/smith](http://www.thegreatcourses.com/smith) effective immediately. See details at [www.thegreatcourses.com/smith](http://www.thegreatcourses.com/smith). Smithsonian National Associate members will also now receive member discounts on GEICO auto insurance at [www.GEICO.com/smith](http://www.GEICO.com/smith) effective immediately; restrictions apply. See details at [www.GEICO.com/smith](http://www.GEICO.com/smith). Starting October 1, 2015, Smithsonian National Associate membership benefits will include, but not be limited to, Smithsonian Magazine, exclusive discounts on The Great Courses, member discounts on GEICO insurance, discounts at our museum theaters, and selected restaurants, Folkways discounts, Smithsonian Associates Art Collectors discounts, and free admission to Smithsonian's Cooper Hewitt in New York. Starting October 1, 2015, Smithsonian National Associate members will no longer be eligible for discounts at FTD, discounts on purchases in the museum stores unless a membership purchase is included, and free access to the iPad edition with a print subscription. Smithsonian reserves the right to change membership discounts at any time; for current benefits, please check [www.smithsonian.com/benefits](http://www.smithsonian.com/benefits). Thank you for your support.

that gravity bends light's trajectory, have inspired a successful technique now used for finding distant planets. When such planets pass in front of their host stars, they slightly focus the star's light causing a pattern of brightening and dimming that astronomers can detect. A similar technique has also allowed astronomers to measure the mass of particular galaxies by observing how severely they distort the trajectory of light emitted by yet more distant sources. Another, more familiar example is the global positioning system, which relies on Einstein's discovery that gravity affects the passage of time. GPS satellites orbiting the Earth determine a receiver's position by measuring the round-trip travel time of signals bouncing between the two. Without taking account of gravity's impact on how time elapses on the satellites, the GPS system would fail to correctly determine the location of an object, including your car or a guided missile.

Physicists believe that the detection of gravitational waves has the capacity to generate its own application of profound importance: a new approach to observational astronomy.

Since the time of Galileo, we have turned telescopes skyward to gather light waves emitted by distant objects. The next phase of astronomy may very well center on gathering gravitational waves produced by distant cosmic upheavals, allowing us to probe the universe in a wholly new way. This is particularly exciting because waves of light could not penetrate the plasma that filled space until a few hundred thousand years after the Big Bang—but waves of gravity could. One day we may thus use gravity, not light, as our most penetrating probe of the universe's earliest moments.

Because waves of gravity ripple through space somewhat as waves of sound ripple through air, scientists speak of "listening" for gravitational signals. Adopting that metaphor, how wonderful to imagine that the second centennial of general relativity may be cause for physicists to celebrate having finally heard the sounds of creation. ●



**NEW****No  
Contract**

# "My friends all hate their cell phones... I love mine!" Here's why.

**FREE  
Car  
Charger**Get  
400 monthly  
minutes for the  
price of 200 with  
WE♥TALK.

*Say good-bye to everything you hate about cell phones. Say hello to Jitterbug.*

**"Cell phones have gotten so small, I can barely dial mine."** Not Jitterbug®, it features a larger keypad for easier dialing. It even has an oversized display so you can actually see it.

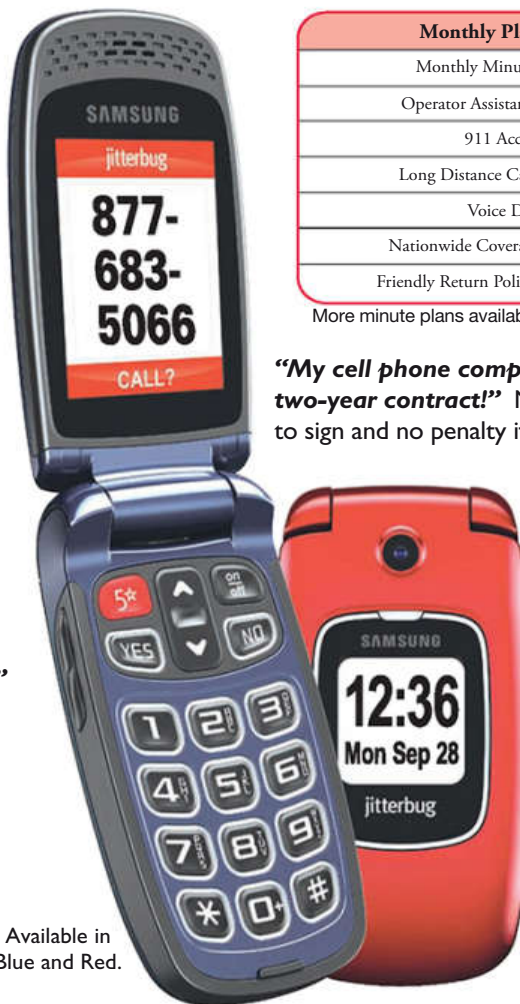
**"I had to get my son to program it."** Your Jitterbug set-up process is simple. We'll even pre-program it with your favorite numbers.

**"I tried my sister's cell phone... I couldn't hear it."** Jitterbug is designed with an improved speaker. There's an adjustable volume control, and Jitterbug is hearing-aid compatible.

**"I don't need stock quotes, Internet sites or games on my phone, I just want to talk with my family and friends."** Life is complicated enough... Jitterbug is simple.

**"What if I don't remember a number?"** Friendly, helpful Jitterbug operators are available 24 hours a day and will even greet you by name when you call.

**"I'd like a cell phone to use in an emergency, but I don't want a high monthly bill."** Jitterbug has a plan to fit your needs... and your budget.



Available in  
Blue and Red.

| Monthly Plan                        | \$14.99         | \$19.99                           |
|-------------------------------------|-----------------|-----------------------------------|
| Monthly Minutes                     | 50              | <del>was 200</del> <b>NOW 400</b> |
| Operator Assistance                 | 24/7            | 24/7                              |
| 911 Access                          | FREE            | FREE                              |
| Long Distance Calls                 | No add'l charge | No add'l charge                   |
| Voice Dial                          | FREE            | FREE                              |
| Nationwide Coverage                 | YES             | YES                               |
| Friendly Return Policy <sup>1</sup> | 30 days         | 30 days                           |

More minute plans available. Ask your Jitterbug expert for details.

**"My cell phone company wants to lock me in on a two-year contract!"** Not Jitterbug, there's no contract to sign and no penalty if you discontinue your service.

**"I'll be paying for minutes I'll never use!"** Not with Jitterbug, unused minutes carry over to the next month, there's no roaming fee and no additional charge for long distance.

**"My phone's battery only lasts a couple of days."** The Jitterbug's battery lasts for up to 25 days on standby.

**Enough talk.** Isn't it time you found out more about the cell phone that's changing all the rules? Call now, Jitterbug product experts are standing by.

**Order now** and receive a  
**FREE Car Charger** for your Jitterbug –  
a \$25 value. Call now!

## NEW Jitterbug5 Cell Phone

Call toll free today to get your own Jitterbug5.

Please mention promotional code 101978.

**1-877-683-5066**

[www.jitterbugdirect.com](http://www.jitterbugdirect.com)

We proudly accept the following credit cards.



**jitterbug.**

**firstSTREET**  
for Boomers and Beyond®  
1998 Ruffin Mill Road  
Colonial Heights, VA 23834



IMPORTANT CONSUMER INFORMATION: WE♥TALK offer valid on 400 minute plan and applies to new GreatCall customers only. Offer valid until plan is changed or cancelled. Jitterbug is owned by GreatCall, Inc. Your invoices will come from GreatCall. All rate plans and services require the purchase of a Jitterbug phone and a one-time set up fee of \$35. Coverage and service is not available everywhere. Other charges and restrictions may apply. Screen images simulated. There are no additional fees to call GreatCall's U.S. Based Customer Service. However, for calls to an Operator in which a service is completed, minutes will be deducted from your monthly balance equal to the length of the call and any call connected by the Operator, plus an additional 5 minutes. Monthly minutes carry over and are available for 60 days. If you exceed the minute balance on your account, you will be billed at 35¢ for each minute used over the balance. Monthly rate plans do not include government taxes or assessment surcharges. Prices and fees subject to change. We will refund the full price of the GreatCall phone and the activation fee (or set-up fee) if it is returned within 30 days of purchase in like-new condition. We will also refund your first monthly service charge if you have less than 30 minutes of usage. If you have more than 30 minutes of usage, a per minute charge of 35 cents will be deducted from your refund for each minute over 30 minutes. You will be charged a \$10 restocking fee. The shipping charges are not refundable. Jitterbug and GreatCall are registered trademarks of GreatCall, Inc. Samsung is a registered trademark of Samsung Electronics Co., Ltd. ©2015 Samsung Electronics America, LLC. ©2015 GreatCall, Inc. ©2015 firstSTREET for Boomers and Beyond, Inc.



ILLUSTRATION BY  
Gina Triplett

Could a volcanic eruption blow ash out of the earth's atmosphere?

Arleigh Pudlick,  
Becker, Minnesota

No volcano has come close. The earth's atmosphere rises about 300 miles, in six layers. The highest volcanic column measured on earth, from Mount Pinatubo in 1991, rose only 22 miles. But that was above the troposphere, or the lowest of earth's atmospheric layers, and "it's hard for ash and particles to fall back through the troposphere," says *Ed Venzke of the volcanism program at the National Museum of Natural History*. The Pinatubo debris circled the globe for years.

All the Mars photos I've seen look enhanced. How bright is it at high noon on Mars compared to on earth? Antonio Betancourt, St. Louis

It would look about like high noon on earth on a cloudy day, says *John Grant, planetary geologist at the National Air and Space Museum's Center for Earth and Planetary Studies*. As for those photographs: For scientific purposes, the cameras on the Mars rovers capture images in many wavelengths of light, some invisible to the human eye. When those images are processed here on earth, they can be filtered to reproduce "approximate true color"—about what we would see if we were there.

# Ask Smithsonian

YOUR QUESTIONS ANSWERED BY OUR EXPERTS

How far down the animal-kingdom ladder does the ability to dream go? Gene Goes, Cincinnati

Dreaming while sleeping is closely tied to the ability to think, and while thinking was once believed to be an exclusively human trait, "in the last 50 years we've shown that animals use tools, have a sense of self and have a mind," says *Don Moore, senior scientist at the National Zoo*. Scientists have evidence that dogs and orangutans dream, and that rats, octopuses and even queen ants at least think while sleeping.

Was the silent "k" in English words such as "knot," "knee" and "knowledge" ever pronounced? Robert Stern, Seattle

It was—until the middle of the 15th century generally, though it persisted in some forms through the 19th century in northern England and Scotland. Why did it go silent? You create the "k" sound in the back of your mouth and the "n" just behind your front teeth. That distance, says *Mary Linn of the Smithsonian Center for Folklife and Heritage*, makes it hard to pronounce the sounds consecutively. Gradually,

English speakers dropped the "k," but speakers of other Germanic languages still pronounce it. Knish, anyone? That's from Yiddish, which began as a Germanic dialect. The word entered English usage around 1900.

The Civil War death toll was recently revised from about 640,000 to 750,000 or more. Where does the new number come from? Thomas Hansen, Rolling Meadows, Illinois

The lower figure originated in the late 19th century with two Union veterans who combed through muster roles, says *David Ward, senior historian at the National Portrait Gallery*. The higher figure comes from a 2011 article published by historian J. David Hacker, based on 19th-century census data. Surviving records may never establish a definitive number of Civil War dead, Ward says, but the essential point—the extraordinary loss of life—remains clear.

TEXT BY Katie Nodjimbadem



Submit your queries at  
[Smithsonian.com/ask](http://Smithsonian.com/ask)



# Your love of history is what led you to the Smithsonian.

Our love of saving people money is what led us to offer a special discount to Smithsonian members.

Now is the best time to start saving **even more.**

**GEICO<sup>®</sup>**  
**#MemberDiscount**

Visit **geico.com/smith** or call **855-395-3421.**



Some discounts, coverages, payment plans and features are not available in all states or all GEICO companies. Discount amount varies in some states. One group discount applicable per policy. Coverage is individual. In New York a premium reduction may be available. GEICO is a registered service mark of Government Employees Insurance Company, Washington, D.C. 20076; a Berkshire Hathaway Inc. subsidiary. © 2015 GEICO



**We create  
chemistry  
that makes  
locked-in  
flavors love  
bursting out.**

Once its packaging has been opened, food is often quick to lose the freshness and aroma that make it so appealing. It's important that we get the most out of what we have available, as the world wastes about one third of its food. Luckily, chemistry can make a difference.

We have developed a range of packaging products, sealants and light stabilizers to protect food. Apart from offering a longer life span, they seal in freshness. So food is still at its best long after the pack has been opened. When less food goes to waste, it's because at BASF, we create chemistry.

To share our vision visit [wecreatechemistry.com/packaging](http://wecreatechemistry.com/packaging)

**150 years**

 **BASF**

We create chemistry